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Contents

Editorial Notes: In Memoriam; Froth Flotation of Coal; The Soap Combine; A Plea for the Chemist; A Reasonable Profit 177
The Fat-Hardening Industry in Switzerland 180
The End of the E.P.D. By Ernest J. P. BENN 182
Public Analysts' Annual Meeting 182
The Driving of Centrifuges. By Dr. F. J. BROADBENT ... 183
History of Alizarine Production 187
Saccharin on its Trial (Monsanto Chemicals Co.) 187
Traffic in Soda Crystals 188
Brass and Aluminium Casting (L. LANGTON)... 191
Erosion of Bronze Propellers (Dr. SILBERRAD) 191
From Week to Week 192
References to Current Literature 193
Patent Literature 194
Monthly Market Report and Current Prices 197
Company News; Trade Inquiries; Tariff Changes 200
Commercial Intelligence: New Companies Registered ... 202

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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In Memoriam

THERE will be no great outlay on hatbands and black gloves in connection with the interment of the Excess Profits Duty. On the contrary, a performance by a group of Morris dancers would be much more to the public taste. For a more obnoxious impost has rarely, if ever, been endured, and the announcement of the Chancellor's decision to discontinue it has been received with universal satisfaction. During the war, it may be freely admitted, the tax was accepted as necessary. It did something to console those who were giving their all to the service of the country by ensuring that others who were making huge profits at home were making them mainly for the benefit of the National Exchequer. But with the disappearance of abnormal war profits, the slackening of business, the growth of unemployment, and the tightening grip of the banks on the flow of money, it began to exert a stifling influence on industrial and commercial enterprise. At present its effect is deadly. It is, perhaps, the chief obstacle to progress at a time when enterprise should be at its highest in order to achieve the quickest possible recovery. On June 30 next the tax will come to an end, greatly to the relief of all business men and greatly, it is to be hoped, to the benefit of the country. The Chancellor's announcement has come as a welcome relief, and already it has produced a sensible increase of commercial confidence.

Froth Flotation of Coal

ALL who utilise coal for industrial operations are not likely to forget the execrable quality of the stuff that was imposed upon them during the war years. We heard of electrical and many other undertakings which found on analysis that nearly a third of the material sold as coal consisted of useless matter, and it was then a question of accepting this or being cut off with nothing. Many of the larger consumers tell us that conditions have certainly improved during the past twelve months, but even now the inert constituents are from 50 to 75 per cent. above the pre-war average. Apparently, therefore, there is still room for considerable improvement. Only the other day the directors of the South Metropolitan Gas Company, in their annual report, remarked that great difficulty was experienced in obtaining coal approaching a quality equal to pre-war standard. They pointed out that the large amount of dirt and stone shipped from the mines not only handicaps gas-making plant, but constitutes a heavy tax on the public, which, in reality, finds the money for its purchase and transport. Such a state of affairs is a grave hindrance to all those industries which depend upon coal, and it is not surprising to find that many have considered the economy to be effected by installing washing plant or buying washed coal. There is no question, however, that the right place to separate coal from its impurities is at the pit head, and not on individual consumers' premises, for in the latter case not only is a considerable amount of freightage space wasted, but the consumer is saddled with the costly problem of getting rid of an excessive quantity of ashes.

From all points of view, therefore, it may be assumed that coal washing at the pit head would prove a national advantage, providing it could be conducted cheaply as well as effectively. Moreover, it would generally conserve existing supplies by rendering available those forms of coal which are now unsuitable for use owing to their high ash content. In the past it has only been possible to treat coals above a certain size in the usual form of washing apparatus based upon the principle of the differing rates of speed with which particles of differing specific gravity travel through water. It would appear, however, that the application of the froth flotation process (which has been employed for a number of years as a means for separating metalliferous ores) to the problem of small coal, is likely to prove of immense importance in the near future. When dealt with under the new process the coal is ground and subsequently mixed with three to four times its weight of water. This mixture is then agitated, and to it is added a small proportion of a special reagent such as an oil or tar product. The agitation then produces an infinite number of small air bubbles, to which the particles of coal become attached. Accordingly, the bubbles, with the coal adhering, rise to the surface, form

a scum, and the latter is skimmed off, leaving the heavier particles of dirt to settle at the base of the tank. In general, one pound of the reagent is required per ton of coal mixture dealt with. All types of coal, from highly bituminous varieties to slurry, can be treated in this way, while a mixture of two distinct types may be separated, without screening plant, merely by controlling the reagent. It is understood that Minerals Separation, Ltd., have now in course of erection a large plant in the Northern coal area, which will be capable of dealing with about 1,000 tons per day.

The Soap Combine

THE report of the sub-committee appointed by the Standing Committee on Trusts in 1919 " to inquire into the soap manufacturing industry in this country and the effect thereon of trade combinations of soapmakers " was issued this week. Though its language is marked by judicial restraint, its conclusions are severe, and on the whole decidedly adverse to the practice of trade combines. The soap trade consists of three combinations—the Soapmakers' Federation, the United Soapmakers' Alliance, and the United Kingdom Soap Manufacturers' Association. The last controls the manufacturers and retail minimum prices for 80 per cent. of the soaps sold in this country. Thirty-seven of the principal soapmaking firms, responsible for at least 70 per cent. of the total British output, constitute one group under the control of Lever Brothers, Ltd. The Lever Combine, according to the sub-committee's finding, dominates the association, and is in a position substantially to determine the price at which soap shall be sold. There is nothing to prevent the Combine from maintaining soap prices definitely higher than they would have been had the companies remained unassociated under their own financial control.

Reviewing the situation in detail, the sub-committee point out that de-control in March, 1919, of oils and fats was followed by a rapid rise in prices, which prices " yielded inordinate profit to all branches of the trade in those commodities." While during the war, when fats and oils were controlled, the price of household soap was advanced 4½d. per lb., the subsequent advance in the price of oils and fats was followed by a further rise from 8d. to 1s. Lever Brothers explained their large profits by the necessity of fixing their selling prices on the basis of replacement cost rather than on the actual cost of the materials used. The sub-committee, however, are not convinced by this argument. They point out that this policy was abandoned as soon as the prices of raw materials began to fall. Nor do they accept as conclusive Lord Leverhulme's explanation of the change of policy—namely, that the bulk of the excess profits made during rising prices, instead of being available to meet losses now, were paid as excess profits duty. Even accepting the explanation they still find—

(*a*) That as a consequence the excess profits duty is really being paid by the present consumers of soap.

(*b*) That shareholders have received enhanced dividends and large sums have been placed to reserve.

(*c*) That there is a provision of the Finance Act allowing losses or reduced profits to be set against earlier excess profits.

(*d*) That the United Kingdom Soap Manufacturers' Association is now in a position to fix soap prices above the replacement value level without fear of competition.

This last point is taken as final demonstration of the complete power over prices possessed by Lever Brothers acting through the United Kingdom Soap Manufacturers' Association.

Frank as these comments are, the attitude of the sub-committee is not wholly censorious. " We recognise," they admit, " that Lever Brothers, Ltd., have had, in the extension of their control, motives other than the mere raising of prices, and that the prices have not been raised to the highest possible limit ; the association has always borne in mind the importance of not reducing the demand. The price of soap, however, is now definitely higher than it would be if there were real competition of price between the soapmakers, and over an average of years has been higher than is necessary to provide reasonable profits." Lord Leverhulme has already issued a short memorandum on the report, in which he states that the prices are fixed not by one firm or combination but by all firms, that reductions have already taken place and will be continued, and that (in reference to the cost of raw materials), while market quotations may come by telegram, raw material has to come by steamer.

Two points of wider general interest are brought out in the report. The first is the sub-committee's statement that there is no immediate prospect of the world's oils and fats markets being controlled by Lever Brothers or any other amalgamation. The second is the possibility of an agreement between Lever Brothers and Brunner, Mond & Co., as to soda ash supplies. On this point the sub-committee state: " Soda ash, an essential ingredient in soap, is the subject of an agreement between the principal alkali manufacturers, by which price is agreed and respective percentages of deliveries allotted. Soda ash is not sold on a competitive basis, and the existence and effects of combinations in the alkali industry are now being inquired into by the Standing Committee on Trusts. Any association or amalgamation or an agreement as to the supply of alkali between only two companies, viz., Lever Brothers, Ltd., and Brunner, Mond & Co., might seriously prejudice, if it did not even jeopardise the existence of, independent soapmakers in this country."

Apart from details, the report does not add materially to the common knowledge respecting the inevitable effects of large combinations. As to remedies, the only practical proposal is one that the Board of Trade should exercise surveillance over the existence, development and activities of trade combinations. Whether this would leave us very much better off is a little doubtful.

A Plea for the Chemist

WE have not seen the case for the necessity of an adequate supply of competently trained chemists put better than it was by a writer in *The Times* the other day. His main point is that the hope of developing in this country a chemical industry, second to none, for the purposes of economic independence and national defence is doomed to failure unless the essential factor of personnel is recognised and fully provided for. " Outpourings of letters, enactments by Parliament, or magical process will not build up a chemical industry. There is required for that a large number of

thoroughly trained, hard-working, and suitably rewarded chemists, and this is where we are failing." Among those who fought hardest for the passage of the Dyestuffs Act this feeling is fully shared, and our real hope lies in its general acceptance.

It is an old complaint that we are without a legal definition of a "chemist," and that the profession suffers in consequence, but the much more important factor, as this writer points out, is the lack of suitable rewards in position and salary. "Large chemical manufactories, he states, "employ chemists, but they are directed by men without scientific training. In other countries a very different state of affairs exists. In the United States, for example, the chairman of the two largest chemical concerns, the Allied Chemical and Dye Company and the Du Pont Company, are chemists. In Germany, the chairman of the great Badische Company is a chemist, formerly employed in one of its laboratories. In the States, a chemist on leaving the university commands a salary of £400 a year, and he can look forward with some confidence to future rises commensurate with the results he obtains. His pride in his profession is evidenced by the fact that the American Chemical Society has over 15,000 members, and is conducting an active and enthusiastic work, while in this country the chemists are organising a trade union as if their calling was akin to manual labour. Until our young men of ability can look forward to a chemical career with ample acknowledgment in salary and advancement of the work that they do, and can have the assurance that they are entering an honourable as well as exceedingly useful profession, we cannot expect them to choose the chemical profession and go in for a thorough training in preference to or on a parity with other important callings. The schools of chemistry, too, must be prepared to meet the demands of the times by increased facilities and enlarged staffs, for any chemical training that is not thorough is almost worse than useless, and the turning out of a large number of 'half-baked' chemists would not meet the situation."

These sound and well-expressed views will command the general assent of chemists, and from the educational side the breadth of view taken by the writer will be no less welcome. "English chemists," as he says, "have been distinguished beyond all others of the world in original thought and creative effort of the first order, and there are a few great minds devoted to the industrial side of chemistry, but the work to be done will not be accomplished by a few men, however brilliant. Their efforts must be supplemented by a vast body of well-trained, hard-plugging men. To provide these, the chemical profession must be recognised properly, and a great educational effort made."

A Reasonable Profit

FURTHER proceedings in connection with the sale of soda crystals at what is held to be an unreasonable profit are reported this week. In a case heard at the Mansion House the profit was shown to have been within 15 per cent., and although 15 per cent. in some cases had been regarded as not unreasonable, the defendant was fined. In each instance it is for the Bench to say whether the profit is reasonable or unreasonable "in view of all the circumstances." The policy of leaving the point to the discretion of the Court has many obvious advantages; at the same time it places a serious responsibility on dealers, for if opinions were invited from London, Manchester, Liverpool and Glasgow, we should probably have different views from the leading merchants of each centre as to what figure represented a justifiable profit. Similarly there may be great variation in the standards followed by those who have to administer the law.

Everyone can appreciate the annoyance with which Brunner, Mond & Co., who manufacture soda crystals and sell them at £5 10s. a ton in order that the price to the household consumer may be kept down, hear of their stuff being sold later at three times their own price. Similar vexation would no doubt be felt by a person who sold his house for £500 and discovered that within three months it had been re-sold for £1,000. In the one case a profit of 15 per cent. is adjudged to be criminal; in the other a profit of £500 passes without notice. On the principle of prevention being preferable to cure, it is a pity that the authorities could not have fixed a maximum profit on all controlled articles, as this would have removed all doubt from traders' minds. It would also more effectually have protected the public than the policy of allowing unreasonable profits to be made and then prosecuting the offenders.

The Calendar

Feb.		
12	North of England Institute of Mining and Mechanical Engineers: General Meeting. 2 p.m.	Newcastle-on-Tyne.
14	Royal Society of Arts: "Applications of Catalysis to Industrial Chemistry," by Eric R. Rideal. 8 p.m.	John Street, Adelphi, London.
15	Hull Chemical and Engineering Society: "The Chemist from the Standpoint of the Business Man"; "Carbon," by C. H. Hardy. 7.30 p.m.	The Metropole, West Street, Hull.
15	The Sheffield Association of Metallurgists and Metallurgical Chemists: "The Production of Steel Castings," by F. Darley. 7.30 p.m.	Hotel Victoria, Sheffield.
16	Society of Chemical Industry (Newcastle Section): "A Quick Volumetric Method for the Estimation of Mercury," by Dr. A. A. Hall; "Fractional Distillation Columns," by S. H. Collins. 7 p.m.	Armstrong College, Newcastle-on-Tyne.
17	Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, London.
17	Society of Dyers and Colourists (West Riding Section): "Recent Progress in Solvent Scouring," by H. Hey.	Yorkshire.
17	Royal Society: Papers by Dr. C. Chree, and others.	Burlington House, Piccadilly,
21	Chemical Industry Club: Address by Mr. W. Cullen on "The Union of South Africa." 8 p.m.	2, Whitehall Court, London.

Books Received

BIBLIOTHECA CHEMICO-MATHEMATICA. Vols. I.-II. London: Henry Sotheran & Co. Pp. 964. £3 3s. net.

The Fat-Hardening Industry in Switzerland

Some Notes on Recent Developments

The author, who has made a study of the hydrogenation problem, describes in the following article the recent development of the fat-hardening industry in Switzerland. In connection with the sale of hardened edible oils the Swiss authorities require them to be labelled "manufactured from hydrogenated vegetable oils," thus excluding fish oils of all kinds.

FREQUENT reference has been made in THE CHEMICAL AGE to the important new industry of fat-hardening—by means of which liquid vegetable oils and fish oils may be converted into hard white fats. The process consists briefly in the addition of hydrogen to the liquid oil in the presence of a catalyst. It forms the subject of numerous patents—more than two hundred up to the present—and constitutes a development of an epoch-making character in the oil, soap and margarine industries both in this country and abroad. Already before the war this new industry had made rapid strides in England, Germany and the U.S.A., and now that the war is over the former rate of progress is being maintained or even surpassed. It was very largely used in Germany during the war for the manufacture of edible fats.

Until quite recently practically all the fat-hardening plants in existence were situated in England, France, Germany and the U.S.A., but now Holland, Spain, Switzerland and other countries are erecting plants for working this valuable process. One of the largest and most recent of these is that of the Compagnie Astra at Glockenthal bei Thun, in Switzerland, erected in the autumn of 1919 at a cost of 5,000,000 francs, and when in full working order about 250 workmen will be employed. The plant is divided into four parts: (1) Seed-crushing and oil extraction, (2) oil refining, (3) fat-hardening, and (4) hydrogen manufacture.

Seed Crushing and Oil Extraction

(1) The oleaginous raw material used consists almost entirely of sesame seed and ground-nuts which are stored in large silos. After undergoing preliminary treatment in shelling and decorticating machines of the most up-to-date type the material is pressed in very powerful hydraulic presses of 250 atmospheres' pressure. The best quality edible oils are always obtained in this manner by "cold pressing," instead of by the use of organic solvents and heat treatment. The material may be subjected to more than one pressing, but the oil from the first pressing is the best quality, and at Glockenthal it is the only grade used in fat-hardening for edible purposes. The residual mass left after the first pressing is again subjected to further pressing, and this time heat is applied.

The residual cake, which is used for cattle-food, still contains up to 7 per cent. oil, and various methods have been tested for further reducing the oil-content of the cake, or, in other words, of increasing the oil yield, but these need not be detailed here. It is hoped subsequently to erect at Glockenthal a special oil extraction plant for dealing with oil-containing residues, cakes and meals of all kinds, with a view to removing as much of the oil as possible. From a cattle-feeding point of view there is no great advantage in leaving a high percentage of oil in the cake or meal, and it is therefore so much oil wasted.

Refining

(2) The refining of the oil before hardening is very important, and in particular any substance in the oil which is likely to have an injurious effect on the catalyst must be rigorously removed. The catalyst used in fat-hardening is an extremely sensitive substance and is very liable to be "poisoned" or rendered inactive, thus bringing the whole process to a standstill. The crude or unrefined oil from the pressing is conveyed into large open vessels provided with mechanical stirrers wherein it is treated with alkali in order to neutralize any free fatty acids present. Such acids will be converted into soaps and thrown down to the bottom of the vessel. The oil is then drawn off and pumped into other vessels, where it undergoes varied treatment, including bleaching with Fuller's earth, and repeated washing and filtering. It is finally rendered perfectly odourless by treatment with superheated steam under vacuum and again filtered. It is now a perfectly neutral and odourless edible oil, and may be sold as such, or passed on to the fat-hardening plant.

Fat-Hardening Plant

(3) This consists essentially of a very high steam-jacketed vessel or autoclave, in which the oil is "hardened" under pressure and at a temperature of 260 deg. Attempts have been made to work at a much lower temperature in order to prevent the oil from being burnt, and in some processes it is claimed that there is no need to go beyond 100°C. The hydrogen is introduced through pipes into the vessel, and the catalyst, which consists of a very finely divided nickel oxide or salt, is mixed up with the oil, either in the fat-hardening vessel itself or before being pumped therein.

If the latter method is used at Glockenthal it would seem that the process used is that of Wilbuschewitsch, the Russian chemist. This particular process was developed by a German firm of oil refiners, the B. B. O. (Bremen Besigheimer Oelfabrik), and finallly bought by Lever Bros., who have a branch or associate company at Olten, in Switzerland. The oil may be hardened to any degree of hardness ranging from a soft paste to a hard tallow-like substance. The same catalyst may be used over and over again after being "regenerated." At present there is no regenerating plant at Glockenthal, but one will be installed later.

Hydrogen Manufacture

(4) The hydrogen is manufactured by the electrolytic method, that is, by splitting water into its elements, hydrogen and oxygen, under the action of the electric current. This yields the purest hydrogen, and purity is essential here also, owing to the strict necessity for protecting the catalyst from poisons. At present the oxygen which is also poduced at the same time, is wasted at Glockenthal, but arrangements are being made for compressing and storing it in cylinders for sale. There is, of course, a large demand for oxygen, but there has been some difficulty in getting the necessary cylinders.

It is anticipated that there will be a large demand for the Astra Company's hardened edible fats, but it will be necessary to comply with the very strict requirements of the Swiss Ministry of Health in regard to labelling, &c. Every package must state clearly that the product is "manufactured from hydrogenated vegetable oils," so that apparently hardened fish oils of all kinds, including whale oil, will be excluded from sale as edible products.

British Production of Barytes

AT a conference of the Association of British Barytes Producers, held at the Cannon Street Hotel on February 3, the present position of this new British industry came under review.

Sir John Ramsden, the President of the Association, said he hoped steps would be taken towards putting the quality of British-ground barytes on a sure basis.

Colonel Ramsden, chairman of the Executive Committee, said the industry provided the raw material for a number of products, owing to its extraordinary chemical stability. To-day the net consumption was up to 80,000 tons per annum, of which, in 1920, 30,000 tons were imported. In 1912 we imported from Germany 40,000 tons, but in 1920 the figure was only 15,000 tons. There was room in the market for all British producers. The Germans were their most serious competitors, and he hoped the Board of Trade understood that the British producers wanted protection for this industry. Germany was well armed with science and knowledge acquired during many years, but our scientists, if we gave them a chance, were far better men than their German compeers. If the English trade really tackled the job it could and would beat its competitors. For their principal customers, the paint trade, they must produce the most suitable raw material at the lowest price. The trade must tell them what they really wanted, and it was for them to make it.

A paper on the grading and grinding of barytes, by Dr. T. Martin Lowry, F.R.S., was considered and discussed by the conference, and the author explained the methods and apparatus in use at the laboratories at Cambridge University.

Reviews

VOLUMETRIC ANALYSIS. By Charles H. Hampshire, B.Sc. (Lond.), F.I.C. (Third Edition). London: J. & A. Churchill, 1921. Pp. 124; 7s. 6d. net.

This edition differs very little from the second edition which was issued in 1919. The book is a small introductory handbook on volumetric analysis and is especially suitable for the use of pharmaceutical students. General methods of analysis with which all chemical students should become familiar are printed in large type, and a number of tests prescribed in the British Pharmacopœia for determining the strength or purity of various chemical preparations are printed in small type.

Among the few new additions to the book we notice the appearance of methyl red in the list of useful indicators described, and that directions are given for testing benzoic acid and salicylic acid, and their ammonium salts, by means of standard barium hydroxide solution. For the examination of bleaching powder three methods of ascertaining the amount of "available chlorine" are now given. In one case the operator is instructed to take 0·25 gramme of the bleaching powder for analysis, and in another case to take 10 grammes, treat it with water until the total volume has been made up to 1,000 c.c., and to use one-fiftieth part of the milky fluid for the test. With a mixture of such variable composition as bleaching powder the latter direction must be the preferable method of selecting the portion to be tested.

The book contains a useful index, but ammonium benzoate and bromide are wrongly indexed, the figures for the two compounds having been transposed. Potassium chlorate has been omitted from the index altogether, although a page devoted to this subject has been added to the present edition.

H. F. H.

RECENT ADVANCES IN ORGANIC CHEMISTRY. By Alfred W. Stewart. Longmans, Green & Co. Pp. 359; 21s. net.

The development of Organic Chemistry, particularly in the production of new compounds which may or may not be of interest to anyone but the chemist who has prepared them, takes place with such rapidity that it is next to impossible for more than a small number of hard-reading academical men to keep pace with even a small field covered by the output. As the author critically observes in one chapter, "Organic chemistry to-day is not properly organic chemistry at all, but has swollen into a chemistry of thousands of compounds of carbon which do not occur in nature. . . It is hardly to be wondered at if the new generation of organic chemists becomes imbued by an almost superstitious reverence for the deluge of organic compounds which have been spawned in thousands in chemical laboratories, for, apparently, no useful purpose whatever." No better corrective for this unfortunate and stultifying view of a great subject, one so vitally concerned with organic life, than Dr. Stewart's book, could be placed in the hands of graduates, post-graduates, or even professors.

It is impossible for the reviewer to do more than indicate the general scope of the work. Three sections are devoted to the Terpenes, a section each to Rubber, the Alkaloids, the Polypeptides, and the Chlorophyll problem—that remarkable natural product so familiar to all as the green colouring matter of plants, and so vital to their natural development and the atmosphere, which has proved such an insoluble problem until the labours of Willstäter and his pupils have, during recent years, thrown light upon its chemical nature. Closely connected is the section on the Anthocyanins, the colouring matters which exist in flowers.

The concluding chapters deal with trivalent carbon; other elements which exhibit abnormal valency; modern formulæ and their failings, and "Some Unsolved Problems." There are many of the last even, as Dr. Stewart points out in his concluding paragraph, among the simplest problems of organic Chemistry.

Dr. Stewart has the rare faculty that few scientific writers possess of winnowing the chaff from the wheat, and of giving to his readers the salient points in connection with his subject, supplementing it all with thoughtful criticism and suggestions. It is no wonder that a fourth edition of his book follows so closely on the previous edition published but a little over a year previously.

J. S. S. B.

TREATISE ON GENERAL AND INDUSTRIAL ORGANIC CHEMISTRY By Dr. E. Molinari. Translated by Thomas H. Pope, B.Sc. London: J. & A. Churchill. Price 30s. for Vol. II. Part 1.

The reviewer opened this imposing volume casually and lit upon the section dealing with "lighting gas." Let it be said at once that to speak of town's gas, which to-day contains but little intrinsic luminosity and is sold on a basis of thermal energy prescribed by Parliament, as a lighting gas is an anachronism, but the account which follows, of the methods of making it is something worse. It is to be trusted that no modern gas engineer will come across this travestied description of his process, for in the first place he has little mercy on those who speak of a "gasometer," and he will be surprised to find that amongst a list of impurities he must remove is carbonoxysulphide. Crude coal gas certainly contains some elusive compounds, but fortunately the trouble of purifying it is not complicated by the presence of COS—unless in the very special conditions which arise from the use of the hot purification process. As the author does not, however, mention this last-named mixed blessing it is presumed that he does not know about it. Naturally one's faith in the remainder of the book is a little shaken by the first impression made by the Gasworks section, but it may be said of it in general that whereas the descriptions of industrial chemical processes are more or less sketchy, the analytical and pure branches of the subject are more carefully and accurately dealt with. The translator has probably done his best with material which does not bear comparison with books by English authors on the same subject. Moreover, if the text is presumed to be sufficiently valuable to be done into English, why should not the illustrations be similarly dealt with? It is particularly annoying for a busy man, anxious for information as to the design of plant, to have to grapple with metric dimensions and Italian wording. And when, for costing purposes, it comes to working in lira, many will give up the conundrum!

C. A.

INTRODUCTION TO QUALITATIVE CHEMICAL ANALYSIS. By Th. Wilhelm Fresenius. (17th edition of the original work by C. Remigius Fresenius). Translated by C. Ainsworth Mitchell, M.A., F.I.C. London: J. & A. Churchill. Pp. 954; 36s. net.

The last English translation of Fresenius' qualitative analysis until the appearance of the present work was that by Groves in 1887. The advances of the subject since that time have been incorporated into the new volume. The first few pages give an account of such general principles of chemistry as are essential to analytical work, particular stress being laid on the ionic theory and the law of mass action. The descriptions of typical operations in analysis which follow are illuminated by illustrations of special apparatus, and the account of the reactions of the metals and of the acid radicles (not very happily described as the "behaviour of substances to reagents") now occupies no less than 438 pp. It is somewhat surprising to find directions for the analysis of a simple substance given, even with an apology, in a volume of such importance, for one is seldom certain to this extent of the nature of a substance under examination. The general procedure for analysis of mixtures of compounds is described fully and accurately, and schemes alternative to that usually followed are appended. Directions for the qualitative examination of such special but important materials as silicates, waters and soils, and of organic substances for inorganic constituents and impurities, particularly poisons, are given in detail, as are methods for detecting alkaloids.

The translation is good, though in places the sentences are long and complex, and more suitable expressions might have been found for some of the headings (*e.g.*, "mixed compounds," "members of rarer occurrence"). Misprints are scarce, and such as have been noticed can be corrected by any imaginative reader. These slight defects cannot in any case detract from the solid value of a work without parallel now presented in terms of modern nomenclature. It is to be hoped that the new edition will replace the "Fresenius," worn with age and use, which is to be found in most analytical laboratories.

P. C. L. THORNE.

The End of the E.P.D.

By Ernest J. P. Benn

AT long last, after two and a half years of the most authoritative agitation, the Government has decided that the E.P.D. must go. From the day when the Armistice was signed, right down to Friday last week, everyone with any claim to speak as an authority on industrial matters, has demanded the immediate abolition of this completely bad tax. All these expressions of opinions have been disregarded and the authorities have only now been willing to take the right line in view of the accumulating evidence, through unemployment and slump, of the damaging effect of this impost.

Mr. Chamberlain deserves the unstinted thanks of the business community for the courage which he has displayed in setting a new precedent. Never before in the history of the Chancellors of the Exchequer has there been a case where a holder of that office was willing to divulge in advance the secrets of a forthcoming Budget. This one act lifts Mr. Chamberlain into the front rank of statesmanship and will make him famous as the creator of a new constitutional practice long after the E.P.D. and all that it means has been forgotten. Mr. Chamberlain will, of course, be severely criticised for the step which he has taken. The House of Commons is sure to call him over the coals; and from many points of view the House of Commons will be right. In recent years the undesirable practice whereby Ministers make important announcements to Trade Union conferences, deputations, and even to their constituents, before addressing the House of Commons, has grown. The Chancellor's speech in Birmingham will, therefore, be regarded as a further attack upon the prestige of Parliament,

Tax Definitely Doomed

The business man will be wise to note that the E.P.D. is now definitely doomed, and to wait patiently before basing any very high hopes upon the details of the final death-bed scenes. There will, of course, be very violent opposition in Parliament from the Labour benches; the Labour Party is committed to a policy of taxing profits out of existence, and it has not the courage or the ability to see that E.P.D. not only damages profits, but absolutely destroys industry. Parliamentary discussion will, of course, bring out a lot of details, and Ministers are sure to make concessions to opposition and qualify in various ways the simple and straightforward utterance of the Chancellor at Birmingham. When the House of Commons has finished with E.P.D. and the Budget is finally passed, the matter will then pass into the hands of the bureaucrats. Tax-payers know from bitter experience that ministerial utterances have a way of finding unexpected interpretations when they ultimately reach the hands of the collectors of taxes. For these reasons the prudent business man will merely experience a sense of thankfulness that a time limit has been set to his troubles and will "wait and see."

In making this belated concession to authoritative pressure, Mr. Chamberlain has done the handsome thing; he has not been content to take any half measures—he has very boldly, and very definitely declared that in the next Budget he will not add to the rate of existing taxation. He mentions specifically income-tax, super-tax, and E.P.D., but, in the version of his speech which was published, says nothing about corporation tax. It might be inferred from the literal interpretation of the Chancellor's words that the removal of the E.P.D. will be accompanied by an increase in the rate of corporation tax. There have been several indications that this would be the way out when the change came, but Mr. Chamberlain was so definite in his self-denying declaration on the subject of taxation generally, that it is unthinkable that he was deliberately making a mental reservation in connection with the corporation tax. We, therefore, have the satisfaction of knowing that however crushing may be future taxation, it will at least be equal as between classes of tax-payers. The disappearance of E.P.D. will still leave industry with the income-tax, the corporation tax, the super-tax, and the new bogey of abnormal local rates, surely a sufficiently oppressive list, untouched. It would seem to be evident from Mr. Chamberlain's speech that the Cabinet has at last come to realise that taxation has reached the breaking point. Perhaps the empty main line trains, the rapidly diminishing number of telegrams, the falling demand of telephones, the dwindling use of the two-penny post, and other simple figures which are before them has reminded Cabinet Ministers that price-raising is not always a sure means of raising revenue; similarly, high rates of taxation which discourage enterprise may produce lower actual figures than would more moderate demands.

Wisdom Deferred

The only pity is that all this wisdom comes so late. Had the Government had a little foresight, and had Mr. Chamberlain made his speech a year ago, we should not now be faced with unemployment or with slump in so acute a fashion as is apparent to-day. However, if we cannot get foresight, we must be thankful for hindsight in high places, and rejoice to know that this E.P.D. madness is at last at an end, and that with it are going most forms of Government control. It will now be up to the business men who have so vigorously demanded these alterations to justify their complaints by demonstrating that the new conditions do give room for enterprise and expansion. We may expect to see developments in all directions which have been delayed pending this announcement, and the result should be a gradual diminution in the number of unemployed and a gradual improvement in the volume of our trade.

Public Analysts' Annual Meeting

New Officers and Council for the Coming Year

THE annual general meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on Wednesday, February 2, when the President, Mr. Alfred Smetham, delivered his annual address. The following were elected officers and council for the ensuing year:

President.—Mr. Alfred Smetham.

Vice-Presidents.—Messrs. W. J. A. Butterfield, C. A. Keane and G. Rudd Thompson.

Hon. Treasurer.—Mr. Edward Hinks.

Hon. Secretaries.—Messrs. P. A. Ellis Richards and E. Richards Bolton.

Members of Council.—Messrs. F. W. F. Arnaud, B. A. Burrell, F. H. Carr, R. L. Collett, C. H. Cribb, Norman Evers, P. J. Fryer, J. H. B. Jenkins, S. E. Melling, G. W. Monier-Williams, Raymond Ross and C. J. H. Stock.

At an ordinary meeting held on the same date certificates were read for the first time in favour of Messrs. Jules Cofman-Nicoresti, Walter K. Fletcher, William Singleton, Francis G. H. Tate, James Darnell Granger, Ph.D., F.I.C., Russell G. Pelly, F.I.C. and Ed. B. Maxted, Ph.D. (Berlin), B.Sc. A certificate was read for the second time in favour of Mr. W. R. Schoeller, Ph.D.

The following were elected members: Messrs. Urban Aspey, Herbert Corner Reynard, B.Sc. (Lond.), A.I.C., Edwin Burnhope Hughes, B.Sc. (Lond.), A.I.C., Harry Jephcott, M.Sc., A.I.C., Arnold Lees, A.I.C.

Abstracts of Papers

In a paper on "Iodimetric Determination of the Diastatic Power of Malts," by Messrs. J. L. Baker, F.I.C., and H. F. E. Hulton, F.I.C., the authors made use of the quantitative oxidation of maltose to malto-bionic acid by means of Iodine in the presence of sodium hydroxide, and details for working the estimation were given, together with results obtained on the same samples by this and the Ling methods. The advantages claimed for this method are the greater accuracy with which the Iodine titration may be carried out, as compared with Fehling's solution, the elimination of an external indicator, and the possibility of using artificial light for the final titration.

Mr. F. W. Smith, B.Sc., A.I.C., in a paper on "Extract of Red Squill (Scilla maritama) as a Rat Poison," pointed out that after considerable practical experiment with different preparations of various types of squills he found that the most effective form of squill rat poison was that prepared in water from an alcoholic extract of the fresh bulb of the red squill (Scilla maritama), and that salicylic acid might be used as a preservative without fear of hydrolysing the glucoside.

In a paper on "The Composition of Harrogate Mineral Waters," by Mr. William Lowson. The author gave a summary of the analyses carried out in connection with Professor Smithell's recent general survey of the Harrogate Mineral Waters, and for comparison a table of analyses dating back some 90 years.

The Driving of Centrifuges

By F. J. Broadbent, M.Sc. (Bristol), B.Sc. (London), A.M.I.C.E.

We publish below the substance of an interesting lecture on "The Driving of Centrifuges," delivered on Thursday, February 3, at the Manchester Municipal College of Technology, by Dr. F. J. Broadbent (Thomas Broadbent & Sons, Ltd., Huddersfield), with a selection of the illustrations accompanying the lecture.

THE driving of centrifugal machines must involve a closer examination of detail than was necessary in considering the general function of the machines, but nevertheless this problem may be dealt with from a chemist's rather than an engineer's point of view, and that I shall endeavour to bear in mind. Lubrication and braking are so intimately associated with the drive that these too will be considered.

When the engineer speaks of "efficiency" in connection with a drive he usually has in mind the technical meaning of the word, namely the ratio of the energy actually converted into useful work to the energy supplied somewhere to the system. Thus, taking the case of water drive by a Pelton Wheel, the engineer may speak of the efficiency of the wheel, meaning the ratio of the useful work to the energy supplied by the jet, or he may think of the efficiency of the system, meaning the ratio of the useful work to the energy supplied to the pump or perhaps by the coal. The only interest this matter has for the chemical user resolves itself into the money cost of laying down the plant, running and maintenance. Reliability under the actual conditions of work is of far greater importance than efficiency in the engineer's sense, and though efficiency of this kind should always be aimed at, it may be by far the least important factor in determining the kind of centrifugal machine to be used. This explanation is given because I am sure there is sometimes ambiguity when an engineer speaks to a customer of high efficiency, meaning efficiency in the sense given above, whereas the customer has in mind a more general meaning, including reliability.

Direct Steam Drive

Except for a special purpose which I shall consider later, all large machines are in direct drive and not through a belt driven by a reciprocating engine, belted rigidly to the side of the outer casing or pan. Since it is impossible to balance a single cylinder engine of this kind an out of balance load is always introduced into the system by this type of drive, and as the cylinder is attached to the pan and drives the spindle of the cage and the speed is high, it follows that the suspended type of hydro extractor must be used, and that the bolted down or Weston types are not suitable. Where there is a plentiful supply of steam of as low as 25 lbs. per sq. inch pressure this type of drive is very suitable, and has stood the test of over 40 years experience. To allow for the swing of the machine flexible steam and exhaust pipes must be used.

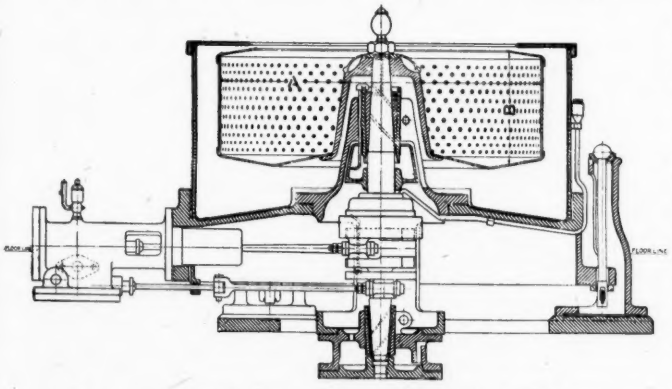


FIG. 1.—SUSPENDED STEAM DRIVEN CENTRIFUGE (SECTION).

Lubrication is carried out through three cups. First, one on the cylinder, second the central cup on the spindle for the top bearing, and third a cup at the side of the pan for the crank, eccentric and bottom bearing. In this connection it is interesting to note that owing to the construction of the machine and the fact that it rotates on a vertical spindle the continuous lubrication of the crank is difficult. The usual conditions are short runs of, say, 10 minutes each, when the lubrication problem is simplified.

Oil Circulation

The circulation of the oil through the top bearing is automatically ensured by allowing it to drain through the bearing into an oil dish rotating on the spindle, and using the centrifugal pressure in this oil for returning it through a fixed tube to the top of the bearing again.

For the crank, eccentric and lower bearing oil, is first fed into a cast-iron oil dish with a top lip. This oil dish again rotates with the spindle and causes the oil to form a vertical wall. Some of this is then trapped in a tube with a "U" end, and when the machine stops this trapped oil falls by gravity and supplies oil for the crank pin which receive this as soon as a fair speed is attained. Part of the oil finds its way to a lower dish which feeds the eccentric and finally the lower bearing. In these machines the bearings are brass bushed and not of the ball-bearing type. This is due to the violent push and pull exerted by the connecting rod. The spindle, crank, and eccentric should all be made from one solid forging, a practice which makes a sound stiff job.

The brake is applied to a ring rivetted to the bottom of the cage. This is always the best position where possible, because it eliminates twisting on the spindle. The steam consumption for ordinary working conditions is not excessive provided that due care is taken to keep the steam dry. Long exposed steam pipes are a great source of loss, and frequently considerable economy can be effected by lagging these pipes. For a 60" machine, starting 5 times per hour, and using steam at 40 lbs. per sq. inch, the cost of coal per hour should not exceed 4½d. with coal at 50s. per ton.

Steam Turbine Drive

For ordinary machines such as we are considering, a steam turbine drive is impracticable as the steam consumption would be so excessive. There is one important exception to this, and that is where the exhaust steam can be usefully employed in the cage for helping to soften grease. In this case the steam can be used in a very simple form of turbine, as economy of steam consumption is not the first consideration. For recovering grease from swarf or oily waste this system has met with very great success.

In small high speed machines, such as the Sharples or De Laval, steam turbine drive becomes economical. Here, as in the grease recovery machine, a simple jet plays on the turbine blades, but in these cases, owing to the high velocity of rotation, and the small power required to drive, the steam is used economically. Turbine drives have the advantage of great simplicity of construction, constant turning movement and no out of balance load due to reciprocating parts.

Weston machines are sometimes driven by an independent steam engine through belting. The speed of the engine is then much less than that of the machine which is geared up through the belting. Such engines are fitted with a governor, and fine speed regulation is possible. As the engine attains speed gradually from rest no slipping device is necessary with this type of drive.

Belt Drive

Belt drives are still used on a fairly large number of machines. Since, in this case, there is a constant pull during rotation, and not a reciprocating action as in the steam driven machines, ball bearings can be used, and for most belt machines this is done. Belt drives are suitable for under-driven suspended, Weston, bolted down, and self-balancing machines. It is impossible with the suspended to use a belt pull in a horizontal direction as this would cause violent oscillation, so that with this type the belt is always led vertically from the centrifuge. Another important feature is that some form of centrifugal slipping clutch should

be used, so that the belt can take up the load gradually without slipping. If this is not done excessive wear and heating occurs with the belt. A slipping clutch allows all the slip to take place on a surface specially designed for this. This form of clutch is applicable for all cases where a load has to be accelerated from rest and, though our immediate concern is with centrifuges, it is worth noting that the application is general. Small belt machines are made of the peg-top type, rotating at high speeds exactly like a top. Hence they are called self-balancing. In some cases the necessary flexibility to allow the machine to centre itself is provided by means of a colloidal rubber buffer, and, in others, by means of springs operating small pistons pushing on the bearing of the spindle. Both types have proved satisfactory in practice.

A problem which sometimes occurs with all drives in treating certain chemical substances is to provide for two speeds. For charging and automatically discharging and for certain processes it is sometimes necessary to run at, say, 1/20 full speed for a considerable time. With steam drive this is easily accomplished by means of the throttle valve, but with belts the solution is much more difficult. One satisfactory solution is shown in which two belts are taken from the driving shaft on to the countershaft. One of these works through the back gearing, much like the back gearing of a lathe; except that the drive is by friction and the other drives the countershaft direct. By an interlocking mechanism only one of these can be operated at once. Lubrication presents no difficulties in belt-driven machines and the breaking is carried out as in steam machines.

Electric Drive

Electric drive can be effected either directly or through belting; it is the former which I am considering. Owing to the low efficiency of electric motors at low speeds, especially alternating current motors, a slipping clutch should always be interposed between the motor drive and the cage in large centrifuges. With single-phase motors the starting torque is practically nil, and, therefore, for this case the slipping clutch must be arranged to remove all resistance to drive until about three-quarters full speed has been attained. This is accomplished in one form by keeping the slipping shoes from contact with the driven element by means of springs until the desired speed is reached, when the load will be taken up gradually. It is worth noting that owing to the small starting torque with induction (A.C.) motors and the large starting torque with direct-current motors, very different weights of shoes should be used for these two cases for the same size of centrifuge for efficient starting up. Full advantage cannot, however, be taken of the large starting torque with direct-current motors owing to the very low efficiency of the motor at low speeds, except at the expense of the efficient motor design or by means of complicated starting gear. The effect of varying the weight of shoes in the slipping clutch is remarkable, as is shown on the diagrams Figs. 3 and 4. The first is for a three-phase motor, and it will be seen that with heavy shoes the acceleration and the current consumption are greater than with light shoes. The great increase in current when the switch is changed over to the running position is clearly shown with the heavy shoes. The second diagram showing the necessity for

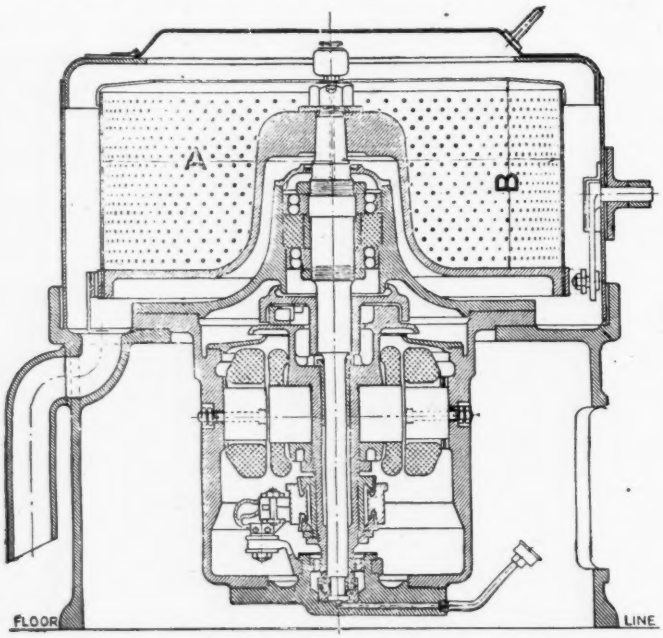
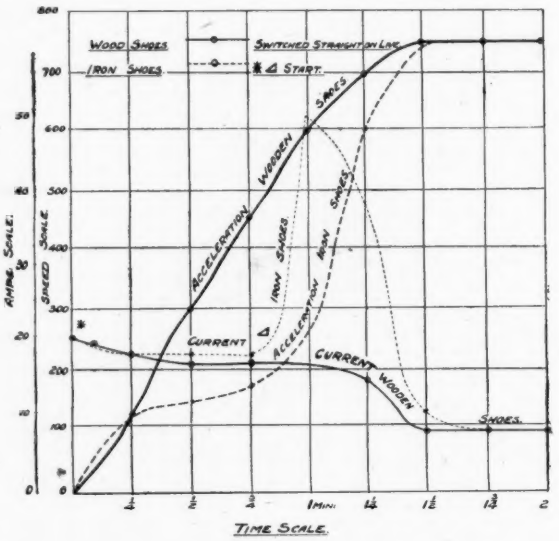
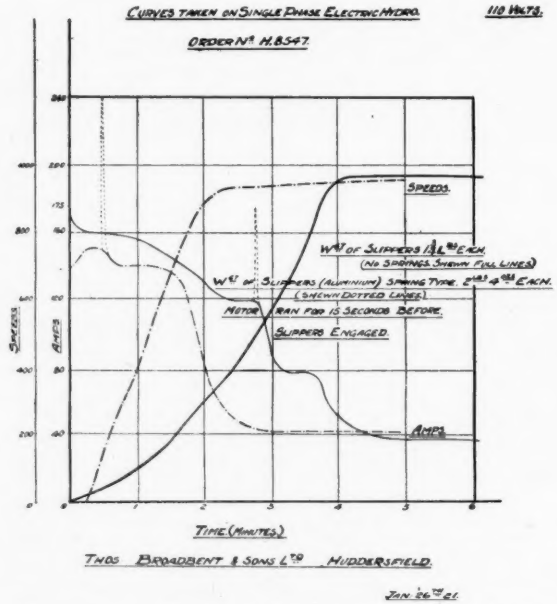


FIG. 2.—SELF-CONTAINED, FIXED, ELECTRICALLY DRIVEN MACHINE (SECTION).



GRAPH ILLUSTRATING THE ACCELERATION OBTAINED ON A 60 A.C. MOTOR FITTED WITH SOLID CAST IRON SHOES 5½ LBS EACH., & WITH WOODEN SHOES 1¼ EACH. BOTH TYPES FACED WITH "FERODO."



FIGS. 3 AND 4.—DIAGRAMS SHOWING EFFECT OF VARYING THE WEIGHTS OF SHOES IN THE SLIPPING CLUTCHES.

springs for keeping off the shoes with a single-phase motor is equally striking. Here the position is reversed in one respect compared with the three-phase drive, that is, the heavier shoe gives much the better result, but this shoe is prevented from doing any work for some time by springs. This allows the motor to accelerate with no load for a time, and even then the load is gradually increased, so that the motor speed is ahead of the centrifuge speed. These diagrams show clearly the

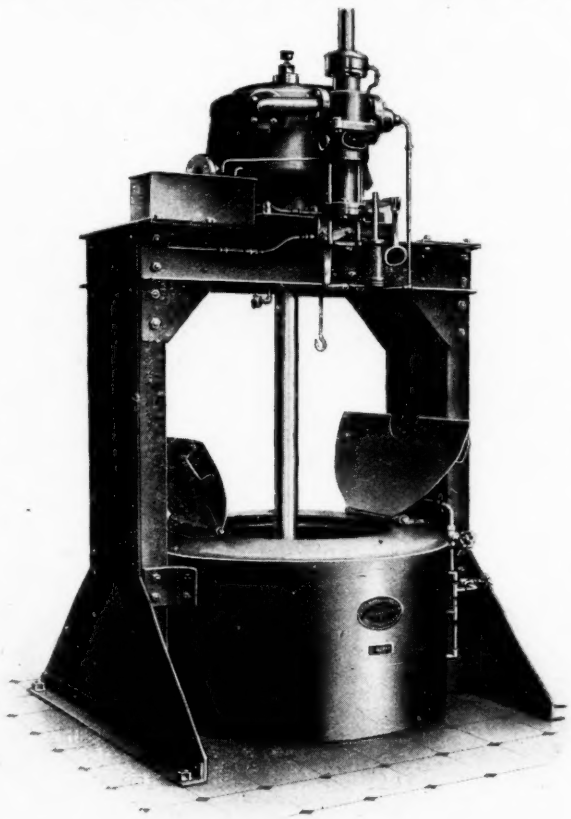


FIG. 5.—OVERDRIVEN TYPE CENTRIFUGE DRIVEN BY WATER MOTOR.

necessity of careful and correct design of slipping clutch and also show that this form of clutch is applicable for all kinds of electric drive. The conditions for driving a centrifuge are severe, and considerable attention has been paid to the motor design. For direct current series, wound motors are the best, owing to their large starting torque, and as the power required is never very large, squirrel cage motors can always be used for A.C. drive. It should be remembered that with this type there is considerable heating up during the acceleration period, and the end rings of the rotor should, therefore, be cast solid to the rotor bars. With A.C. motors only certain speeds are possible. These speeds are the number of cycles per minute divided by the number of pairs of poles, that is, by some whole number; less the slip, which is only a small fraction of the synchronous speed. Thus, with 50 cycles per second, or 3,000 cycles per minute, speeds a little less than 1,500, 100, 750, 600, &c., can be obtained; but if a speed of about 1,200 were required, direct drive would be impossible. The convenience of electrical drive and the ease of getting the necessary energy to the motor by wires are so great that where the conditions allow it, it is undoubtedly the best. At the same time, some chemical work is so destructive and other chemical work so readily inflammable, and electrical machinery is always to some extent delicate, that careful consideration of the conditions is necessary before electrical drive is installed. It is, perhaps, hardly necessary to say that motors for direct drive should be well protected. In either the Weston type, where the motor is well above the work, or in the under-driven type, this is not usually a difficult matter, but is of vital importance. In the Weston type the motor is on a rigid stand, and the swinging of the cage is allowed by means of flexibility at the centrifugal coupling.

Where two speeds are required, special starting gear may be used with direct-current drive; but with alternating current this is impossible, and either some form of reduction gear on the hydro spindle or a separate auxiliary motor driving through bevel and circular rack may be used. In the latter case the starting of the main driving motor should ensure the auxiliary drive being thrown out of action. In one type of drive the auxiliary motor drives by means of a helical cam with flat faces. The drive is by means of the flat faces, and the gear is thrown out of action by the helix of the driven part riding up the helix of the driver when the main motor is switched on. This draws the driving bevel for low speed out of mesh. Taking the same condition as for the steam-driven centrifuge, with current at 1½d. per unit, the cost of current per hour of running a 60" machine under ordinary conditions is about 4½d., or about the same as steam.

Water Drive

Where a battery of machines is to be used, and especially in the severe condition existing in most chemical works, water driven is the best, because of its extreme simplicity. The actual drive itself consists of a jet or jets of water playing at a high speed on the shaped buckets of a water wheel, known as a Pelton wheel. The pressure in the water is obtained from a pump, and will usually be from 150 to 200 lbs. per square inch, depending on the design of Pelton wheel. Unlike either belt or electrical drive, water drive should not be used with a slipping clutch. The diagram shows very clearly the reason for this. The torque is a maximum at the start, and falls off

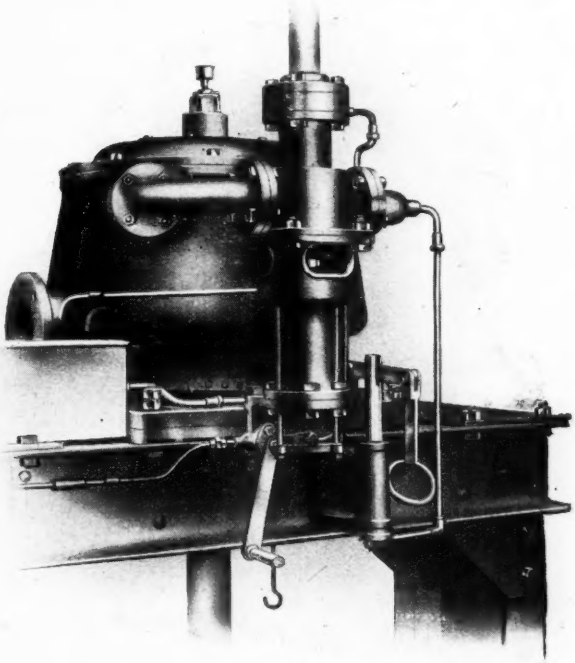


FIG. 6.—"BROADBENT'S" PATENT CONTROL VALVE FOR WATER-DRIVEN CENTRIFUGES.

as the speed increases. It follows that if full use is to be made of the greater starting torque, the driven cage should be arranged to rotate at the same speed as the driving wheel. It is also probably better to run water-driven machines at a speed just beyond the most efficient, because at such a speed the efficiency and torque begin to fall rapidly, and hence with great variations in load there will be a very small variation in the maximum speed of the machine. Where it is not essential to accelerate rapidly, a single jet may be used for accelerating and running, but where, as often happens, full speed must

be attained rapidly, the starting torque, great though it be, is not sufficient, and some means must be taken for increasing it. The only practicable way of doing this which has been developed up to the present is by means of a second or accelerating jet, which operates during the speeding-up period, and is then automatically cut out, as otherwise the speed might become dangerously high. This undoubtedly complicates the mechanism and is wasteful in power. There are several ways of carrying out this operation. In one there is a centrifugal governor which trips a trigger at the required speed, and so closes the valve to the accelerating jet. In another a float chamber is supplied with water from the discharge in the Pelton wheel chamber, and at a certain time this lifts a ball float and operates through a trigger as in the first place. In both these forms there is a separate valve for each jet, but the operating handle starts up both jets together. In a third method, which has been patented recently, a single valve with two sets of ports feeds both jets. A hollow piston valve operated hydraulically is arranged to cut off either or both sets of ports. The pressure in the water is used for moving the piston valve by means of a plunger in a separate chamber. A small three-way pilot valve is operated by the starting lever and opens the pipe into the plunger chamber, either to pressure or to exhaust. To start, this lever is put in the position for pressure, and the piston valve is pushed to the top, exposing both sets of ports, and at the same time automatically turning the pilot valve into the neutral position. Water from the Pelton wheel chamber is taken to a float chamber, and if the correct position is chosen in the Pelton wheel chamber it is found that no water flows until more than ¾ full speed is attained. The float on rising opens a small valve which exposes a small port at the proper place in the plunger cylinder, and allows water to escape from this cylinder so that the plunger descends pushed by the water pressure in the piston valve chamber until the water valve just cuts off the upper ports which are in such a position that only one jet is now in operation. The float valve is exactly like the ordinary float valve of a w.c. flush tank, but reversed in action. When the starting lever is thrown to the position for exhaust, the valve descends closing both sets of ports. Several advantages are claimed for this valve. First, there is only one simple operating lever, with no mechanism to a second lever, as with two-jet valves. Second, as the ports are opened by hydraulic pressure this can be, and is, arranged to act slowly, so that the water hammer due to opening a valve rapidly can be eliminated. Third, should any leakage take place in the plunger system the valve automatically closes. Fourth, if it is at any time required to run on one jet only, this can easily be done. Also, in connection with this valve, pressure water is led from the supply to the running jet to a plunger which holds off the brake. Hence, this can only be applied when both jets are cut off. Water drive is equally applicable to under-driven or over-driven (Weston) machines. The former are simpler to design, as there is no difficulty with the size of exhaust casing, and the whole machine is on fixed bearings. In the latter the Pelton wheel can be either rigidly attached to the driving spindle, in which case the buckets oscillate with the cage and are not always in the best position for driving, or the Pelton wheel can be used as a separate driving unit and drive through a flexible coupling. For the former it is claimed that if too violent swings take place the machine will not attain full speed. The latter, I think, makes a better engineering design. The brake should, of course, be readily accessible, and should be away from the water.

In the under-driven type it is a great advantage to have the Pelton wheel below the bottom bearing, as this prevents any water from finding its way into this bearing. Where two speeds are required water drive can be easily adapted, either by hand control on the valve, or automatically by means of a governor for the lower speed. Interlocking arrangements can also be arranged so that only certain machines in a battery can run at the same time. One mechanical means of doing this by means of levers is in use, but an even better arrangement is by means of hydraulic plungers operated from the running jet supply to close the starting lever of the machine which is to be locked, in exactly the same way as the locking arrangement for the brake is arranged. Lubrication presents no difficulty in water-driven machines, as ball bearings are used throughout, and lubricating tubes are easily led to these. The cost of running water machines will not differ materially from the cost of running electric machines, though with a group of four machines it will probably be rather less, but for maintenance and ease of operating and keeping in order, this drive is certainly the best and, under the conditions existing in a chemical works, is far superior to other types. If repair costs are to be kept to a minimum it is worth passing all the exhaust water through an enclosed filter before returning it to the pumps. The most usual form of pump is the duplex steam, but in a sufficiently large installation a high lift centrifugal pump can be used with advantage.

Driving Special Machines

Let us turn now to a few of the special machines dealt with in the last lecture. In one form of Gee machines an electric motor drives through a rope. A centrifugal slipping clutch is used, and, in addition, there is a neat rope tightening pulley. In the self-contained drive, which is the usual standard with the Gee machine, a countershaft runs on the machine structure and drives by belting over guide pulleys. A centrifugal slipping clutch is again in circuit. In another form the countershaft is placed above the machine, and, as before, is driven either from a motor or from a line shaft. The Gee machine is also arranged for direct electric drive in which case there are a flexible coupling and a centrifugal slipping clutch inserted. The countershaft and belt are for working the lifting gear, an important feature of this machine.

De Laval machines are driven through belting from a small motor or by direct steam turbine. Owing to the high speed, even the belting does not drive direct, but through a very efficient worm wheel on to a worm. Two means are used for keeping the belt tight, one by means of an auxiliary or idle pulley, and the other by means of raising the motor bodily on its stand by a screw permanently placed for the purpose. Owing to the small power required to start up such small machines no slipping clutch is used though, with alternating-current motors, and especially of the single-phase type, such a device would eliminate the necessity of starting by pulling round by hand. Where steam is available the direct steam turbine drive is used, and owing to the high speed this can be done economically. The drive is then direct, and the question of slipping clutch does not arise. In this form it will be noticed that a centrifugal governor is used to limit the speed. Lubrication presents no difficulties in these machines. A steam turbine drive is also used with the Sharples machine, but in this case there is no governor.

The Sturgeon machine is driven by a belt, and is interesting because the shoes of the slipping clutch are placed on the driven portion, and do not rotate at the start. Springs are used to cause slight pressure at rest, and this causes slow rotation. As the speed increases the slippers gradually grip more and more until, as in the ordinary form, the drive takes place with no slip. I am unable to see any advantages in this over the ordinary form, as there must be a greater resistance to start than with the usual type.

Where labour is cheap, as in India, hand power drive is used for machines up to 18 in. diameter. Occasionally for experimental, 9 in. machines, this drive is used in this country, but it is better to drive by means of a small motor and a belt. Even with such a small motor if the current is alternating it is an advantage to drive through a slipping clutch.

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Australian Carbide

In the House of Assembly last month the Tasmanian Treasurer moved that the Government be authorised to generate interest at 6 per cent. on £120,000 to assist the Carbide Company at Electrona. He said that the company had met one difficulty after another. Recently an embargo had been placed on the importation of carbide into Australia, but there were 1,500 tons of carbide dumped in Australia from a foreign company, and until that was sold the local company could not dispose of its product at an advantage. The proposal was for the company to borrow in London £120,000 on the Government guarantee of interest, which was to be devoted to paying the Commercial Bank of Australia £20,000, the Government £50,000, sundry creditors £6,000, and the balance would be working capital. The company could make 100 tons of carbide weekly, worth £30 a ton, and the working expenses were £2,000 a week, leaving an ample margin. The resolution was agreed to.

History of Alizarine Production

British and German Methods Contrasted

IN an article in *Drug and Chemical Markets* (January 9) a writer reviews the history of alizarine production as illustrating the contrast between the commercial policies of British and German manufacturers. He says:

"The history of alizarine in England and Germany provides a striking example of German monopolistic methods. The practical system for the manufacture of alizarine, which is used in dyeing fabrics various shades of red, was patented almost simultaneously in England and Germany in the year 1869. The English patentee was Perkin, and the Badische Company became the owners of the German patents. Both patentees exchanged licenses, so that Perkin obtained a monopoly for the manufacture of alizarine in Great Britain. In 1873 more than twice as much of the dye was manufactured in Germany as was produced by Perkin, and a few years later the Germans completely dominated the supply. This was due to the commercial enterprise of the German manufacturers rather than to their superiority in science or large-scale production. By sending representatives abroad and establishing agencies all over the world the Germans had, by 1881, got so great a hold on the market that they joined forces and formed the first Alizarine Convention for the express purpose of raising prices. As a result the Germans cleared $5,000,000 on this dye alone in one year.

"The next year, 1882, which was the year before the expiration of the patent, the German manufacturers of alizarine issued a circular in which the British consumers were informed that their supplies of the dye would be cut off unless they renewed their contracts at a new and increased price for a period of twelve months after the expiration of the patent in 1883. Since the price advance was highly unreasonable, the Scotch turkey red dyers replied to this threatening circular by going on short time to conserve their stocks and formed a co-operative organisation, the British Alizarine Company, to meet their needs for this dye. As a consequence the first Alizarine Convention came to an end in 1885, and prices reached a record low level. But the extraordinary profits made by the German dye industry through the alizarine monopoly enabled them to write off the cost of their works, to reconstruct them with large laboratories and to develop them with skilled research chemists.

"The formation of the British Alizarine Company saved the Scotch turkey red dyers. Failing to put this company out of business, the Germans finally, in 1900, succeeded in making a convention that included the British company. This convention guaranteed to the British organisation the sale of a certain quantity of alizarine at a fixed price. This quantity turned out to be totally inadequate for the needs of the United Kingdom and colonies, and, when the war broke out, there was consequently an acute shortage of alizarine.

Chemical Shortage During the War

"Similar shortages were found in all other dyestuffs and practically all chemical supplies. During the first years of the war the British Government was faced with tremendous problems in attempting to provide sufficient quantities of dyes for textiles, and to produce sufficient high explosives to feed the guns of the army and navy.

"Among chemicals of German origin being offered in England at the cost of production or less are salicylic acid, aspirin, bromides, acetanilide, saccharin, atropine, benzoic acid and benzoates. Already the production of phenacetin is being abandoned in England because of foreign imports. With the chemical industry being disorganized the British Government has promised it protection through a general bill dealing with the key industries.

"The first chemical that came into prominence in England during the war was anhydrous sulphuric acid. The total pre-war demand for this acid was 500 tons a week, whereas German production was at least 10,000 tons weekly. As soon as the English found it necessary to manufacture nitroglycerine, guncotton and T.N.T. in large quantities they were greatly handicapped by the lack of sufficiently large plant. There was also lack of plant for producing chlorine, hydrogen and ammonia. In 1913 the Germans manufactured 100,000 tons of ammonia from atmospheric nitrogen at a cost of about $25 a ton, and in 1914 the whole of it was placed on the European market at more than $50 a ton.

Saccharin on its Trial

To the Editor of THE CHEMICAL AGE.

SIR,—We assume that you are more or less familiar with the controversy regarding saccharin that has been going on for some time past, culminating in a suit which the U.S. Government brought against us, and which came to a trial during the fall of 1919.

Dr. Alsberg, chief of the Bureau of Chemistry of the Department of Agriculture, sent a copy of the digest of the testimony of the Government's witnesses to all State and Municipal Food and Drug Officers. We feel that if Government officials desired to make public any of the testimony adduced at that trial, they should, in all fairness and as a matter of public interest, give both sides. However, Dr. Alsberg apparently did not so view the matter. We, therefore, have had a digest prepared of the testimony of the witnesses introduced by our counsel, and we have had this printed side by side with the digest of the testimony of the Government's witnesses which Dr. Alsberg sent out. We are enclosing a copy herewith for your information, and leave you to judge whether the Government has made good its charge against saccharin. The burden of proof was on the Government officials and they failed to maintain this burden, as the jury disagreed.

The Government charged that the statements on our labels were false and misleading, in that we claimed saccharin was: (1) healthful; (2) a perfect sweetener; (3) positively harmless. The Court dismissed the first two counts, and therefore the case hinged on whether or not saccharin was positively harmless, as we claimed. Immediately upon our learning of the disagreement of the jury, we requested the Court to proceed at once with another trial so as to get the question—if any—settled definitely, once and for all, but the Government's attorneys declined, and although over a year has elapsed since the trial the case has not yet come up for trial again.

We are also enclosing for your further information a reprint of an article written by our chairman, Mr. John F. Queeny, titled "Saccharin *versus* Sugar," which appeared in the February (1920) issue of your New York contemporary, *Chemical Age*.—Yours, etc.,

MONSANTO CHEMICAL WORKS,
St. Louis, U.S.A. EDGAR M. QUEENY, *Secretary*.
January 25.

January Trade Returns

Exports Down Again

THE Board of Trade Returns for the month of January do not make a very favourable showing. It is true that there is a very substantial decrease in the value of imports, the month's total being £117,050,738. This figure is £25,734,462 less than the December figure, which was the lowest during 1920, and compared with January, 1920, the figure under review, shows a decrease of £66,292,205. While these figures give a certain amount of satisfaction, the exports at £92,756,094 are less satisfactory than were those for the previous month of the corresponding month of last year. The total exports for January, 1921, including re-exports, aggregate £102,711,213, as compared with £131,344,386 for the corresponding month last year.

Imports of dyestuffs show increases in alizarine, synthetic indigo, but the total value (chemicals, drugs, dyes and colours) £2,343,541 shows a decrease of £686,959 on the total for January, 1920. Exports under this heading at £3,386,148 show a slight increase of £32,481 over last year's figures. The detailed statistics show that compared with January, 1920, the quantities of sodium compounds all show substantial decreases, with the exception of chromate and bichromate, in which an increase of 536 cwt. is recorded. Zinc oxide is lower by 170 tons. Coal tar products are down 5,839 cwt., but the values show an increase of £53,682. Exports of barytes are given at 125 cwt., as against 717.

In reference to the death, which occurred on January 9, of Mr. D. Rainy Brown, principal of the firm of J. F. Macfarlan & Co., 9, Moor Lane, E.C. 2, it is officially announced that the business will be carried on as usual by the trustees, and that the management and staff will remain unchanged.

Traffic in Soda Crystals

What is a Reasonable Profit ?

AN adjourned summons under the Profiteering Act was heard at the Mansion House on Monday, when Alexander Henry Pickering, of 85-88, Minories, E.C., pleaded not guilty to a charge of selling on the 3rd of May last to J. C. Densmore & Co. 10 tons of soda crystals at £15 10s. per ton, being such a price as to yield a profit which in view of all the circumstances, was unreasonable.

The case for the prosecution was outlined last week, when Mr. H. D. ROOME, who prosecuted on behalf of the Board of Trade, said that owing to the fact that soda crystals were being sold by a retailer in Bermondsey at 2½d. per lb., inquiries were started. It was found that the firm in question had paid £16 10s. per ton, and, including carriage from Glasgow, £19 5s. 2d. per ton for the crystals. The retailer had purchased them from Densmore, Densmore from the defendant, at £15 10s., and the defendant from Barr & Co., chemical merchants, of Glasgow, at £13 10s. per ton.

Evidence was given by Major Howard, who made the inquiries under the Act, and he, on Monday, went into the box for cross-examination.

Major HOWARD, in answer to Mr. G. W. H. Jones, counsel for the defence, agreed that in all prosecutions in connection with soda crystals under this Act, the profit had been over 15 per cent. This, he said, was "the low water mark of profiteering."

Mr. JONES cited cases in the Board of Trade *Journal* and an oil and colour trade journal as showing that 15 per cent. profit had not been regarded as profiteering. The witness could not say what the gross profit of Brunner, Mond & Co. was. He did not know that after paying excess profit duty, they had paid a dividend of 11½ per cent. on capital. He only knew their price—£15 10s. per ton—not their profit.

Mr. JONES: Did defendant say his experience in dealing with Government officials had been unfortunate ?—Yes.

Did he say that a gentleman from a Government department, who had made inquiries into the quinine business, was now in business in opposition to the firms he had visited ?—Yes.

And he gave that as his reason for declining to give information ?—Yes.

In re-examination by Mr. ROOME, the witness said that Brunner, Mond & Co.'s price for the home markets at dates covering this case was £5 10s. per ton.

A representative from Messrs. Densmore, chemical agents and importers, said he considered 15 per cent. well within the market limits; up to £19 was being quoted, and at that date he regarded £15 10s. as a reasonable price to pay. He considered Mr. Pickering's profit fair profit for a merchant, and he thought in this transaction Mr. Pickering acted as a merchant, an charged an "all in" price. When he acted as a broker he would charge brokerage or commission—something like 1 per cent; in such cases the broker only acted as intermediary between buyer and seller. Mr. Pickering's firm was nearly a century old, and was one of high repute.

By Mr. ROOME: Mr. Pickering was a broker in the chemical trade. £1 a ton was profit enough for the witness's firm. He did not think there was any difference between the risks run by his firm and Mr. Pickering's.

Mr. STANLEY GEORGE STUBBS, investigation officer under the Act, said he had dealt with 200 complaints as to soda crystals, and in the light of his experience his opinion was that the average profit of a broker in this trade was something a little under 10 per cent. By broker, he understood a person who did not handle the goods, but sold them on paper. Without reference to records he could not give names of firms in connection with whom complaints had been received. Cross-examined by Mr. JONES as to the difference between a broker and a merchant, the witness agreed that as broker all defendant would have had to do in this matter was to fix up a contract between Barr and Densmore.

Mr. JONES: The test of a merchant is that he acts as principal and takes risks ?

Mr. JONES remarked that fortunately or unfortunately the Act did not fix the rate of profit, but simply provided that it should not be unreasonable. He quoted rates applying to soda crystals at the date in question, and contended that in this case no "unreasonable" profit had been shown.

Defendant said his firm was established in 1830 as quicksilver brokers and chemical merchants. He did not deal in soda crystals until the war, and had had only a few transactions with that article. He had warehouses of his own and rented them in various parts of the country. He, in this case, acted as merchant.

By Mr. ROOME: This transaction was done by his clerk. He considered 15 per cent. a reasonable profit. He had no actual proof of the quinine incident.

Mr. ROOME: J. C. Barr, chemical merchants, only make 10½ per cent., Densmore makes 6 per cent., and you butt in the middle and make £2 per ton profit, and as a result the public in one place have to pay 2½d. per lb.

The defendant: I was responsible for the 48th part of a penny of that amount, and but for my services the crystals would not have been obtained at all.

You don't think your profit for this essential commodity excessive ?—No.

Did you not simply put Densmore into communication with Barr, and take £2 a ton for no useful purpose ?—No. I bought of Barr, and sold to Densmore.

Turning to the quinine incident, in answer to Mr. Roome, defendant said he did not know the name of the official who visited him and others. But under the Defence of the Realm Regulations they had been forced to disclose their buyers and sellers in the quinine trade which had now gone. Their goodwill had been sold for nothing, and a corporation set up in opposition on the knowledge thus gained.

Mr. JOHN JAMES BARLOW, joint secretary of the Chemical and Dyestuffs Trading Association, and a Justice of the Peace, quoted prices about the time of the transaction, which varied from £13 to £16 10s. These figures had been supplied by leading merchants in London, Manchester and Glasgow. He did not consider 15 per cent. an unreasonable profit, especially as Mr. Pickering was selling at a lower price than was quoted elsewhere in the market.

The LORD MAYOR said the Act put a responsibility on the defendant. Considering the small risk he had taken in this transaction, he considered his profit unreasonable. He should inflict a fine of £25, and £15 15s. costs.

A Canterbury Firm Fined

AT Tower Bridge Police Court last week J. E. Finch, trading as James Finch & Son, Ltd., at North Lane, Canterbury, was fined £25 with 25 guineas costs for selling soda at an excessive rate of profit.

For the Ministry of Food it was stated that in May last year the defendant sold 10 tons of soda crystals to Littlewood Brothers, London-road, Bermondsey, at a price of £8 per ton. The defendant was summoned before the local profiteering committee, and had admitted purchasing the soda at £5 9s. per ton, and reselling it without having handled it. Later he informed the committee that he had purchased the soda at £7 10s. per ton. This statement, however, was on inquiry found to be untrue. Mr. Waddy said that the defendant's explanation was made with the idea of misleading the Profiteering Committee.

Importation of Dyestuffs

THE Chemical and Dyestuffs Traders' Association announce the receipt of an official communication from Mr. Percy Ashley, of the Board of Trade, regarding the Dyestuffs (Import regulation) Act, 1920. In this communication the Board of Trade state that it is hoped to publish, at as early a date as possible, a list of the various products which are at present considered as coming within the scope of the Act. The consideration of applications for import licences, it is pointed out, will be greatly facilitated if it can be shown that the goods are definitely required by an actual consumer who is unable to meet his requirements from British sources of supply. Information furnished will be treated in confidence. Should there be a definite objection on the part of a merchant to furnishing such information, it should only be supplied when definitely requested by the Committee. On the question of the importation of dystuffs for re-export purposes, it is stated that it is not possible to lay down any general rule, and each application will have to be considered on its merits, having regard to the particular circumstances obtaining.

Patent Law and Chemical Research

Secret Processes and Patents Compared

A COURSE of six lectures on the above subject has been arranged by the Liverpool section of the British Association of Chemists, to be delivered by Mr. Harold E. Potts, M.Sc., of Liverpool, in the Lecture Theatre of the Chemical Department of the University, Liverpool. The lectures will be open to chemists who are interested in the subject. The first of the series was delivered on Monday evening and dealt with "Patents as an Element of Business Policy," Dr. Auden presiding.

Mr. Potts first gave a historical review of progress in the recognition of inventors' rights and of the protection which the patent laws had given them. The principle of patent law was, he said, to encourage new industries in this country, and a patent was regarded in the light of a contract between the Crown and the inventor. If an invention has been made, the Crown will grant a monopoly of its use for a period of 16 years, and the consideration for this reward was that the inventor should give a full account of his secret, so that the public would be able to use it freely at the end of the monopoly period. The inventor could put forward his best efforts and justify the expenditure of capital in the assurance that others would not be able to appropriate the results of his work. The public at once gained new information which stimulated further research, with the assurance that the invention would become public property in 16 years. In each case industry was stimulated, and it was only by the grant of a monopoly that this could be done.

The lecturer next considered the question of patent policy, first, from the point of view of a firm, and, second, from the point of view of the inventor. This was of special importance in chemical industry because so many of the great inventions were worked out in the laboratories of, or in collaboration with, individual firms.

Secret Processes

If the invention consisted of a new filter press or centrifuge sold by a maker of chemical plant, it was clear that he would obtain an increased advantage over his competitors if he could obtain a monopoly of the new type. His difficulty would be to decide whether to try to supply the whole demand himself, or to increase turnover by licensing his competitors to manufacture on royalty. But if the same filter press were invented by a chemist working for a firm, using filter presses very extensively, although they would probably obtain the best return by licensing the new press to others, yet they might conceivably feel that it would be worth their while to prevent anyone else from using the press, whether under royalty or not. The question arose, was it wiser to obtain a patent or to work the process in secret? It would be seen that this problem arose much more acutely in chemical processes because it was often possible to sell the product without giving any information of the process, whereas a machine, once sold, could usually be copied.

Risks of Disclosure

The lecturer next compared the advantages of the two systems and the relevant principles of patent law. In practice, the problem was, he said, complicated by the fact that absolute secrecy and absolute patent monopoly were usually impossible. It was then necessary to consider relative risks, the advantages of secret working with its attendant risks of disclosure, and patenting with its attendant risks to sustain an infringement action. From the patent point of view everything depended on the kinds of patent protection obtainable. The utmost skill and labour were required if effective protection were to be obtained. It had been suggested that one reason why chemical patents had been unsatisfactory in the past, had been a failure, either of the patent agent to comprehend the the chemical side of the problem, or of the inventor to realise that the legal difficulties of chemical cases called for special treatment. The legal experience of the patent agent must be supplemented by the experiments and technical knowledge of the inventor, and both must co-operate in studying the invention and all its particulars. The possibilities of successfully carrying out secret work were clearly much less now than they were in the days when chemical industry was less developed in this country. There were two important difficulties; independent invention by others, and leakage of information, accidentally or as a result of good faith. Chemical research was so widespread, that, when a new problem arose, it was probable that several investigators would hit on the same solution independently.

Proving Validity

Opponents of the patent system argue that it is difficult to enforce patents because (*a*) they may be held invalid, and (*b*) it was necessary to prove infringement. In a series of years before the war an analysis of the cases which came into Court showed that in 65 per cent. of the chemical patents the patentee was successful in proving validity. When once it was possible to establish a *prima facie* case, a Court might grant an order for an inspection of the competitors' works by independent scientific men or others, to determine whether the alleged infringement had occurred. Orders for inspection had been given in chemical cases and infringement of chemical process cases had been proved, even when the defendant refused to disclose his secret in public so that part of the case was heard *in camera*. This happened in the leading case of Badische *v.* Levinstein. A Court had even granted relief in a case in which the defendant was selling goods manufactured abroad by a process which they alleged to be a secret, but which the Court held to be an infringement. This patent dealt with the manufacture of silica bodies by fusing sand about a carbon core, in an electric furnace (Thermal Syndicate *v.* Silicaware, Ltd.). If the invention founded a new industry and was worked by a manufacturer or exploited by a syndicate, the case for patenting was stronger *a fortiori*. The first essential in framing a patent policy was that the subject must receive serious attention as a branch of the larger business policy pursued by the executive. In England, there seemed to be an impression among many able business men and technologists that patents were not of much importance unless they were master patents or covered extremely important processes. This was a fundamental error which overlooked the most important strategical conception of patent policy, that of creating a favourable situation.

Discussion

Dr. F. W. KAY, alluding to the lecturer's references to the secret working of inventions, said he did not think it was true that a patent must be worked to be valid.

Dr. A. TURNBULL asked whether it was a fact that if a firm were keeping a process secret, and a patent were taken out by a competitor, all the firm had to do was to take a patent out and prove that they had been using the process for years. Could they in that way, he asked, upset the patent granted?

Mr. J. E. SOUTHCOMBE did not think it desirable to patent everything that could be patented or to weave a net of patents around everything that could be brought into it. Germans had taken out patents the specifications of which were very carefully stated; by what we might call the "block" method, whereby the "block" might prevent people from proceeding as far as possible on certain lines. In other ways that had been done by the purely technical method in the wording of a specification, that made it very difficult in carrying out a patent.

Mr. ATACK thought that one point arising out of Mr. Potts' paper ought to be emphasised. The fundamental difficulty in the past had been to obtain a patent agent who could appreciate the difficulties of patenting. In Germany patent agents attached themselves to particular firms. If we were to follow that, in this country, it would be necessary, for example, that the dye firms employed patent agents to draw up the necessary applications. The course had generally been to employ a chemist to draw up the specification. If we were to build up a strong dye industry in this country, it would not be sufficient to proceed on those lines. It would be necessary to submit a full description to a patent agent, without disclosing too many details.

Mr. POTTS, in the course of his reply, said that the present Act gave four years as the period of working a patent, though it was not necessary to do any work for the four years. Dr. Turnbull was quite correct in saying that if a firm had been using their secret process, and while doing so, someone else took out a patent, it was possible to upset the patent by bringing an action to revoke the patent or by bringing out another patent. The Courts in this country would not tolerate some of the methods which were employed by the Germans. It was necessary for a patentee coming to the Crown, to show the best of good faith. He did not thing the practice of the Germans in giving away as little as they could, would be followed in this country.

Association of Industrial Chemists

Statement of Practical Aims and Policy

In his presidential address to the members of the National Association of Industrial Chemists at Newcastle on January 5, Mr. E. Turner, B.Sc., President of the Newcastle Branch, said that every organisation must have an aim and a policy, and the policy must be practical and not Utopian as trade unionism tended to make it. The most practical policy was based on a study of the economics of industry. The chief aim of industry at the present crisis was to produce and export, which could be accomplished in one of two ways: (1) by the fullest possible use of all mechanical appliances, and (2) by the proper utilisation of man power. He condemned the "ca'-canny" policy and ceasing work when sufficient money had been made.

Regarding man power, he said that the war created a scarcity of labour and unions were forced to accept dilution. In chemistry young men from the army were given a few months of University training, and turned into factories as trained chemists. The scarcity of labour, however, had passed, and that sort of dilution was to be resisted. An essential feature in trade development was improvement and research. During the war we had assistance from neutral countries, which were now against us competitively. The neutral countries had encouraged research work and initiative amongst the workers.

Mr. Turner read the records of the various countries on patents, which showed that England was behind regarding patents. He laid the blame at the door of the Government, which displayed a great lack of interest in the inventor and research worker. Industry should aim at setting aside a margin of profit for research work.

His reason for the lack of inventive research were the flat wage rates which crushed the initiative in workers, and he advocated a grading according to ability, and the discouragement of flat rates; further competitive tenders and contracts reduced industrial profit to the narrowest margin, leaving nothing for research work. The N.A.I.C., was formed on a broad basis to include all. Its policy should be inclusive, and not exclusive, young chemists gaining admittance as associate members. The aim of the Association with regard to the younger members should be to provide such educational facilities as would fit them for full membership. The terms of admission, he thought, were fair, and compared favourably with contemporary unions.

He dealt at length on the fact that the N.A.I.C. had always attempted to carry on instructive lectures in addition to the ordinary work of a Trade Union. In his opinion, the future policy of the Association should be to seek amalgamation with other kindred chemical organisations, and to federate with other professional unions. He concluded by an earnest appeal to all to share in the work of the Association, and not to leave the work to a few.

The Dyeing of Paper Pulp

Obtaining Fast Colours in Wallpaper

At a meeting of the West Riding Section of the Society of Dyers and Colourists in Leeds on February 3, Mr. J. Huebner delivered an address on "The Dyeing of Paper Pulp."

The lecturer said that the application of dyes to paper differed from the application to textiles, principally because of the disintegration of the fibres in the beating process, which increased the absorption of dyestuffs to a marked degree. In testing cotton fibre with night blue, he had found that cotton fibre in the normal state absorbed 15 per cent. after one hour's steeping, but after the fibre had been beaten for one and a-half hours the absorption is increased to 52 per cent. Loading materials such as china clay introduced fresh factors. Sizing had a valuable effect in facilitating the dyeing of paper pulp.

Mr. Huebner added that in many paper mills more dye went into the waste water than on to the paper itself. Satisfactory results could only be expected when all the factors were considered—type of paper, sizing, and loading. A systematic investigation should therefore afford valuable information to the industry.

In the course of a subsequent discussion Mr. W. B. Walker said he had experienced difficulty with woollen yarns wrapped in paper for storage. The yarns were dyed with a combination of three colours and wrapped in white bleached paper, but after a time the red colour vanished from the yarn. He had been unable to imitate this result with any of the common reagents.

Mr. Huebner did not think there would be any explanation of the defect by reason of acid or bleaching agent being present, as great care was usually taken to prevent it. In some cases, however, washing was followed by the addition of antichlor, and possibly the trouble might arise from that cause.

Mr. H. W. Edmondson said another point which they had all experienced was that three months after they had had a room papered they might want to move a picture, but on lifting the picture they would decide to put it back in the same place. (Laughter.) If Mr. Huebner's investigations would help towards producing really fast colours in wallpaper they would be a benefit not only to dyers and papermakers, but to the community at large.

Dyestuffs and National Security

Importance of the British Industry

In a lecture before the Dyers' Guild at Bradford, on February 5, Sir Joseph Turner, K.B.E., said that the passage of the Dyestuffs Act was amply justified by economic reasons, and by the importance of scientific and industrial research. Reasons of national security had prompted the Government to pass this special legislation. There was no question which exercised the minds of statesmen more than that of disarmament, and the dyestuffs industries of the various countries were most intimately associated with this problem.

In the first two years of the war the General Staffs of all the belligerents learnt that the consumption of high explosives in modern warfare was vastly greater than any of them had anticipated. The Allies had to construct special works for the manufacture of high explosives and to provide enormous quantities of shipping for bringing to Europe the vast supplies of Chili saltpetre necessary for the manufacture of nitric acid. Each of these nitrate ships had to make a long ocean voyage through seas infested with German submarines.

There could be little doubt that, had no sources of supply of nitrogen but Chili saltpetre been available to Germany, she would have collapsed during 1915, but the German Government had at its call a complete mechanism for solving this problem, namely, the German dyestuffs industry, with a vast capacity for nitrating hydrocarbons, and also plants for manufacturing nitric acid from the atmosphere, expanded at the cost of many hundreds of millions of marks to the German Treasury, which saved the explosives situation from the German point of view. Whereas in 1913 the yearly output in Germany of nitrogenous materials obtained with atmospheric nitrogen was 4,000 tons per annum, the corresponding figure for all the new German plants when completed would be 200,000 tons per annum.

The Germans introduced a new weapon into the armouries of nations, namely, that of chemical warfare; they were only enabled to carry out their purpose because they possessed a highly developed dyestuff industry, and the weapon was of an extraordinarily effective nature in the field. Therefore, the dyestuffs industry in connection with the problem of national defence came into predominance, and provided justification for the Dyestuffs Act. The Government had a right to hope that the users of dyestuffs in this country would co-operate with them in their desire to establish a British dyestuffs industry, for the economic and military security of the Realm, by limiting the demands made upon foreign sources of supply to the absolute minimum.

Proposed Engineers' Club

The proposal to form an engineers' club in London, which shall be a central meeting place for members of all branches of the engineering profession, is rapidly gaining support. A very representative number of engineers have consented to act on the provisional committee, which includes Sir Dugald Clerk, Sir Robert Hadfield, and Messrs. Max Muspratt, Frank Merrick, and W. J. U. Woolcock, M.P. Mr. Edmund L. Hill, 39, St. James's Street, S.W. 1, acting secretary, will furnish particulars to those interested in the scheme.

The Casting of Brass and Aluminium

By L. Langton

AT a meeting of the Lancashire Branch of the Institution of British Foundrymen, held on February 5, Mr. L. Langton read a paper on "The Casting of Brass and Aluminium." He said the peculiarities of aluminium were manifold. It was a treacherous metal to deal with, and sometimes when one fault was cured another arose in its place. Only experience would enable one to succeed. Most metals united readily with aluminium, the exceptions being lead and antimony. The addition of copper gave greater strength and rigidity, but after a certain point the alloy became too brittle. Zinc also united readily with aluminium, as much as 20 per cent., and sometimes 25 per cent., being easily alloyed with it, but with such high zinc contents the alloy was unsuitable, except for the most common castings. Sal ammoniac was a good flux with aluminium.

Mr. W. H. Cook said his advice to the members, based upon long experience, was, don't be tempted into casting aluminium in small quantities in a shop where other metals are being cast. It should only be done when it was a matter of large quantities and one could afford to sink a little money at the beginning. Another word of warning was as to the losses. Those accustomed to gunmetal began to worry when their losses exceeded 5 per cent. In aluminium casting 30 per cent. in losses was better than most people did. The addition of a little phosphor tin had a wonderful effect.

Mr. Miles said without a flux the aluminium could not be cleared. He had found the best flux was a mixture of half common salt and half fluorspar.

Mr. Carter agreed with the lecturer that sal ammoniac was the best flux for aluminium.

Mr. Key asked what proportion of arsenic in copper would make it unsuitable for use in casting. Supposing there was 0·001 per cent. present in the mixture what effect would it have?

Mr. Langton replied that it would not affect the strength of the wearing qualities of the casting. He had not gone very closely into the question of losses, but they were certainly not as much as 30 per cent. Pure aluminium was not satisfactory for casting, but few people specified it. He had not used phosphor tin as a flux.

The Erosion of Bronze Propellers

Chemical Action a Negligible Factor

AT a meeting of the London Section of the Society of Chemical Industry on Monday, Dr. O. Silberrad reviewed researches made in conjunction with Messrs. Charles and P. R. Parsons during the last twelve years, which have led to the adoption of the type of bronze alloy for the manufacture of high-speed propellers. This work has resulted in the discovery of the erosion-resisting alloys that are now used throughout the world for the propellers of high-speed ships, and the researches in question have proved incidentally that the deterioration of these propellers is due to mechanical erosion brought about by a combination of frictional rub with the action of water broken by evacuated spaces in which no air is present.

The first ship equipped with propellers cast in the new alloy was the "Mauretania." These propellers were made because the original propellers, which were of the old type of bronze, were worn out in three months. The new propellers were fitted in January, 1909, and at the end of six months their condition was reported to be perfect.

The author has come to the following definite conclusions: (1) Chemical action is a negligible factor in the erosion of bronze propellers; (2) galvanic action does not appear to come into play at all; (3) the presence of dirt in the castings has only a slight detrimental effect; (4) the true cause of the deterioration is mechanical, and is therefore properly termed erosion, the determining factors being (*a*) the frictional rub of the water, (*b*) the impinging on the propeller blades of water broken with evacuated spaces which subsequently collapse on the propelling blades, both of which conditions are more liable to arise in high speed ships or propellers moving at a high velocity.

It was observed that although a copper zinc brass of pure structure is not a satisfactory alloy, nevertheless alloys quite equal in mechanical properties to the old-established bronzes can be produced by introducing small quantities of aluminium, manganese, iron, &c. Having thus established the practicability of producing improved erosion-resisting alloys of this type, their further development and application followed as a matter of course.

Mr. A. T. Quelch, who supported the author's views as to the origin of erosion, after an experience during which he said he had made from 16,000 to 17,000 tons of bronze propellers, asked a question as to the size of crystals in the beta structure which could be produced by adding aluminium, manganese, iron, &c., to the ordinary copper-zinc alloy. It seemed to him that there might be considerable variation in the size of the crystals, which would have a considerable influence on the mechanical properties.

The author, in reply to this point, said he had not gone into this matter in the paper, because it was a purely metallurgical one, but it was an advantage to have the crystals as small as possible.

Utilisation of Subsidiary Alkaloids

Paper by Profe sor F. L. Pyman

THE fifth meeting of the Session of the Manchester Section of the Society of Chemical Industry was held at the Textile Institute, Manchester, on Friday, February 4th. Mr. John Allan presided and there was a full attendance of members. Owing to the absence of Professor Pyman through illness, the paper was read by the Hon. Sec., Mr. L. Guy Radcliffe.

In the paper Professor Pyman contrasted the utilisation of subsidiary alkaloids with the transmutation of base metals into those of higher value. He briefly outlined the general process for the isolation of liquids, referring particularly to Ematine isolated from Ipecacuanha, and pointed out that this was associated with certain other alkaloids, which, by comparatively simple means, could be converted into the commercially valuable Ematine. Consideration was also given to the stereo-chemical differences existing among certain alkaloids and special reference was made to Atropine and the Lævo form of Hyoscyamine, an explanation being given showing how the latter could be changed into Atropine. Reference was also made to Pilocarpine and its relationship to Iso-Pilocarpine. Details were also given of the chemical methods used for the methylation of the hydroxyl group and of the amido group, as well as methods of hydration in connection with Ergotinine.

A considerable portion of the paper was devoted to the esterification of Ecgonine obtained from the Erythroxylon Coca Bean, and showed how the lesser valuable alkaloids could be easily and technically converted into the valuable cocaine. Reference was also made to the opium alkaloids; especially the utilisation of Narcotine and Papaverine. In the latter portion of his paper Professor Pyman referred to the optically active varieties of the styptic Adrenatine, and also to the constituents of the Hydrastis Canadensis, better known as the Golden Seal. Special emphasis was laid upon the value of the main substance Hydrastine as compared with Berberine, which latter was of little or no medicinal interest.

A discussion followed in which the chairman, Mr. Walmsley and Dr. Bloch took part.

Import of Research Chemicals

Concession to Approved Research Institutions

IN reply to an inquiry from the Institute of Chemistry as to whether licences would be necessary under the Dyestuffs (Import Regulation) Act, for the import of small quantities of organic chemicals (including intermediate products used in the manufacture of dyestuffs, &c.), required solely for research purposes, the Board of Trade state that "whilst it is not possible to regard small quantities of organic intermediate products which may be required for research purposes as being outside the scope of the Act, the Board will be prepared to issue general licences for the importation of such products to approved research institutions, covering periods of three months and limited only as to total quantities. This procedure will obviate the necessity for separate applications for a large number of small items, but it will be a condition of the issue of any general licence that a detailed return shall be furnished at the end of the three months during which the licence is in operation, of the quantities of each product actually imported under it."

From Week to Week

EXTENSIVE ADDITIONS are being made to the Amherstburg plant of Brunner, Mond (Canada), Ltd.

LORD MOULTON is to be the guest of the Association of British Chemical Manufacturers on Wednesday next.

A DEPOSIT OF SODIUM SULPHATE estimated at about 100,000 tons and covering about 800 acres was advertised for sale in *The Times* on Wednesday.

A FIRE at the premises of The Jackson Company, manufacturing chemists, 172, St. John Street, London, E.C., on Wednesday night caused considerable damage.

According to an Exchange Telegraph message from Copenhagen, an important Norwegian syndicate is building a large CELLULOSE FACTORY at Alexander Bay, Newfoundland.

The Scottish Shale Miners' Union have received intimation from Scottish Oils, Ltd., of their PROPOSAL TO REDUCE SHALE MINERS' WAGES by 2s. per day.

During the September quarter of 1920 Australia imported DRUGS, CHEMICALS AND FERTILISERS valued at £1,678,618. The share of the United Kingdom amounted to £732,736.

It is reported that one of the largest consignments of ANILINE COLOURS yet received in the United States of America reached New York last month from Antwerp.

The Soda Mining & Products Co. are contemplating the erection of a NEW EVAPORATING PLANT at Soda Lake, British Columbia.

FERTILISERS for use on the tea, rubber, cocoanut and other plantations are being imported by Ceylon in increasing quantities.

The French Senate has passed the Bill for opening a credit to enable the State to acquire the ALSATIAN POTASH MINES, which are at present in the hands of the Public Custodian.

The ANNUAL DINNER of the Pottery and Glass Trades' Benevolent Institution will be held at the Hotel Victoria, London, on February 22. The chair will be taken by Mr. G. E. Alexander, O.B.E.

The AMERICAN POTASH INDUSTRY is reported to be in a more promising condition than at any time since the armistice, and the production for 1920 is expected to exceed even that of 1918.

The EXHIBITION OF BRITISH SCIENTIFIC PRODUCTS at 198, Rue Saint Jacques, Paris, and organised by Mr. T. C. Dannat for the British Scientific Apparatus Manufacturers, Ltd., has attracted a large number of visitors.

Speaking at the annual dinner of the South Staffordshire Mining School's Old Boys' Society, Dr. Grindley said the NEW TECHNICAL COLLEGE AT DUDLEY would contain a well-equipped mining department.

The Bradford Corporation CHEMICAL WORKERS have had their wages increased by 3s. 6d., plus 12½ per cent. bonus, from the first pay day following January 1 last, in accordance with the award of the Industrial Court dated February 4.

An announcement was made at a recent meeting that the FEES FOR GRADUATING COURSES at St. Andrew's University are to be raised 50 per cent. in the Faculties of Science and Arts.

As a result of two years research work by Mr. Langley Shaw in conjunction with an Australian scientist a COLLOIDAL CLAY SOAP is being manufactured by Loftine, Ltd., Alpha Mills, Ilkley, Yorks.

It was suggested at a recent meeting of the Gas Committee of Glasgow Corporation that the FOUR CHEMICAL WORKS belonging to the Corporation should be photographed from the air, and that these photographs should be exhibited at the chemical department's stand at the British Industries' Fair.

The Managers of the Royal Istitution, in accordance with the Actonian Trust Deed, have awarded the ACTONIAN PRIZE to Professor G. E. Hale, D.Sc., LL.D., F.R.S., Director of the Mount Wilson Solar Observatory, for his contributions to solar physics.

The report of the South Metropolitan Gas Co. states that the MANUFACTURE OF INTERMEDIATES has now been undertaken on an important scale, and that efforts extending over several years to produce a grade of sulphate of ammonia equal to the German product have been successful.

In a lecture on the possibilities of the UTILISATION OF SEA-WATER for obtaining raw material for Norwegian industry. Professor Helland Hansen declared that the Norwegian salt works at Bergen would be able to produce nearly 500 tons of salt and 100 tons of metallic magnesium, besides gypsum and other chemical products.

THE DUNDEE JUTE TRADE Employers' Association has written to the Minister of Labour that they will be compelled to close down their works indefinitely unless the industry is withdrawn from the operation of the Trade Boards Act so that employers' and workers' organisations may take immediate steps to adjust wages to the present emergency.

The Chemical and Dyestuff Traders' Association understands that no final decision has yet been come to by the Cabinet as to the PROVISIONS OF THE PROPOSED KEY INDUSTRIES BILL. There is, however, no intention in any case to include heavy chemicals within the scope of the Bill; and, even in the case of fine chemicals, the probability is that the measure will be limited to certain classes of pharmaceutical products.

Interest has been evinced in tinplate manufacturing circles in the arrival at Liverpool from America of a cargo of 600 tons of ELECTROLYTIC TIN. It is claimed that this American electrolytic tin, refined from Bolivian ore, which is cheaper than the Straits tin ordinarily employed in tinplate manufacture, is so exceptionally pure that it has the advantage of running freely, and not adhering to the plate, as is the case with the brands used at present.

The annual report of the University of Birmingham states that SIR JOHN CADMAN, who felt compelled to resign his professorship of mining engineering on his appointment as adviser to the Cabinet, has accepted the Council's invitation to act as professor in mining engineering and adviser in the department of petroleum technology, giving such time to the office as his other duties permit, with an honorarium of £500 a year.

Speaking in London on Tuesday night, Mr. Francis H. Carr, of the British Drug Houses, Ltd., said that in INDUSTRIAL CHEMISTRY RESEARCH lay not only the keys to the commercial supremacy of Britain, but also her greatest guarantee against future attack by any foreign power, and her main road to victory in the event of any such attack being made. It was only by the alliance of chemical research to industry that we could hope to meet effectively the flood of German competition.

At a meeting of the Gas Light & Coke Co., Mr. D. Milne Watson said that the company had produced during the war for the MANUFACTURE OF EXPLOSIVES 3,451,800 gallons pure benzol; 1,041,300 gallons pure toluol; 311,600 gallons solvent naphtha; 1,946 tons crystal carbolic acid; 5,556 tons pure naphthalene; 14,098 tons concentrated oil of vitriol; 1,748 tons nitric acid; 1,128 tons nitrate of ammonia; 23,254 tons concentrated ammonia liquor; 5,317 tons liquid ammonia; and 1,472 tons anhydrous ammonia.

The report of H.M. Petroleum Department on drilling operations in the United Kingdom for the year 1920 states that an ANALYSIS OF THE HOT WATER met with in the carboniferous limestone at Ridgeway showed that the constituents of the water calculated in parts per 100,000 by volume, were calcium carbonate, 13·75; calcium sulphate, 173·79; strontium carbonate, 1·50; magnesium sulphate, 15·35; magnesium chloride, 34·92; sodium chloride, 162·55; and lithium chloride, 1·20.

Testing of Clinical Thermometers

As there is reason to believe that numbers of imported thermometers are being offered for sale in this country without having been officially tested, the Board of Trade point out that, under the provisions of the Clinical Thermometers Order, 1918, no person may sell, offer for sale, supply or deliver any clinical thermometers which have not been tested, approved and marked at the National Physical Laboratory. Purchasers should, in their own interests, see that any thermometers offered to them bear the official test mark, namely, a monogram formed with the capital letters N.P.L. followed by two figures denoting the year of test. The above quoted requirements apply to foreign thermometers imported into this country equally with those of British manufacture, but clinical thermometers exported from the United Kingdom need not at present be tested and marked.

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Patent Literature

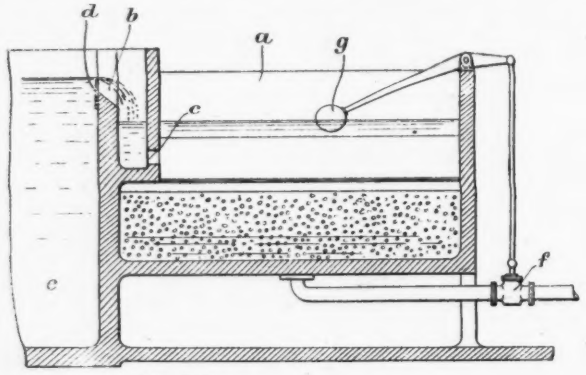
Abstracts of Complete Specifications

156,269. FUSIONS WITH MOLTEN CAUSTIC SODA OR CAUSTIC POTASH, METHOD OF CONDUCTING. B. D. Steele, Ministry of Munitions, Storey's Gate, London, S.W 1, and R B. Robertson, The Newlands, Sandiway, Cheshire. Application date, February 9, 1918.

The process relates to reactions in which molten caustic soda or potash is used, such as the manufacture of synthetic phenol or β-naphthol. The soda or potash is first melted in an iron pot, and a hot concentrated solution of sodium benzene sulphonate which is contained in a steam-heated vessel at a higher level is slowly run on to the surface of the molten soda or potash. The process is also applicable to all cases in which a sulphonic group is to be replaced by an hydroxyl group by means of fusion with molten alkali.

156,270. FILTERING APPARATUS. W. Paterson, 11, Southampton Row, London, W.C. 1. Application date, March 2, 1918.

The object is to ensure the supply of the proper proportion of liquid to each filter of a battery of filters such as is used, for example, in the case of large water filtration installations. Each filter *a* is provided with a pocket *b* communicating with the filter by a passage *c*. Liquid flows into the pocket *b* from a precipitating tank *e* or other source of supply over a measuring weir *d*. The outlet *f* from each filter is controlled by a float *g* in the filter, so that it is opened to an extent proportional to



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the head of liquid. The balance between inflow and outflow is thus maintained until the filter bed becomes choked with impurities, when the level of water in the filter reaches that of the weir *d*. The inflow then ceases, and the liquid is distributed uniformly among the remaining filters while the choked filter is being cleaned. If a considerable fall of water between the level in the tank *e* and pocket *b* is undesirable on account of its effect on the flocculent precipitate in the water, the opening *s* may be controlled by a valve attached to a float in the pocket *b*, so that the liquid level in the pocket is raised, and the difference in head occurs between the pocket *b* and tank *a*.

156,284. HEAVY OILS, TREATMENT OF. A. E. Dunstan and F. B. Thole, Meadhurst, Cadbury Road, Sunbury-on-Thames. Application date, July 8, 1919.

The object is to prevent the gradual separation of amorphous hydrocarbons in the use of heavy and viscous oils such as the residual asphaltic paraffin base oil produced in the distillation of petroleum. In the application to a 50 per cent. residuum of an asphaltic paraffin base oil, the oil is heated to 400°C. under a pressure of 200 lb. per square inch for one hour. The oil is thus subjected to a mild cracking treatment, and in one example the solid hydrocarbon content was thus reduced from 4.0 per cent. to 0·25 per cent. A small amount of light cracking products is formed, and may be removed in the ordinary way by dephlegmation. The oil thus treated is particularly suitable as fuel oil.

156,324. VERTICAL GAS RETORTS AND THE LIKE, MACHINES FOR CHARGING. Goodall, Clayton & Co., Ltd., Pepper Road, Hunslet, Leeds, C. R. Payne, 19, Virginia Road, Wellfield, Huddersfield, and J. A. Archdale, 20, Gledhow Wood Grove, Gledhow, Leeds. Application date, October 6, 1919.

A machine for charging vertical gas retorts, coke ovens and the like, more particularly gas retorts of the intermittent type, comprises a hopper having two delivery shoots each fitted with a telescopic end, which may be raised or lowered by levers. When the telescopic end is raised it runs clear of the retort mouthpiece, but when lowered it fits closely within the mouthpiece, and thus prevents discharge of gas.

156,328. SULPHURIC ACID, MANUFACTURE OF. South Metropolitan Gas Co., 709, Old Kent Road, London, S.E. 15, and P. Parrish, 64, Foyle Road, Blackheath, London, S.E. 3. Application date, October 6, 1919.

The apparatus is for the manufacture of sulphuric acid by the interaction of sulphur dioxide and oxygen with nitrous sulphuric acid. The acid is placed in a closed tank sub-divided into compartments by partitions extending downwards from the roof into the acid to a depth not exceeding 4 inches. The lower edges of the partitions are preferably serrated, and stirrers are provided below the level of the partitions. The reacting gases are passed into one end of the tank and bubble under each partition in succession to the outlet at the other end. The consumption of power for raising the acid is smaller with this apparatus than with the usual absorption towers and the volume of the apparatus may be reduced to 1-1·5 cubic ft. per pound of sulphur converted into sulphuric acid, as compared with about 3 cubic ft. in the case of Opl towers.

156,329. PARA-CYMENE, MANUFACTURE OF. British & Foreign Chemical Producers, Ltd., 10-12, Copthall Avenue, London, E.C. 2. (From Rheinische Kampferfabrik, G.m.b.H., Dusseldorf-Oberkassel, Germany.) Application date, October 6, 1919, Addition to 142,738.

Specification 142,738 (see THE CHEMICAL AGE, Vol. II., p. 643) describes the manufacture of para-cymene from the fractions of Swedish, Polish and like turpentine oils which boil at 175°C. by treating them with chlorine, distilling with steam, and rectifying. It is now found that the process is applicable to the terpenes which boil at about 160°C. These fractions are subjected to a preliminary heating with an inorganic or an organic acid or acid salt, the reagent is separated, and the hydrocarbons purified by fractional distillation. The fractions specified are then treated with chlorine, the product is distilled with steam, the oil which passes over is heated with a small proportion of an oxidising or condensing agent such as zinc chloride, and the product is distilled.

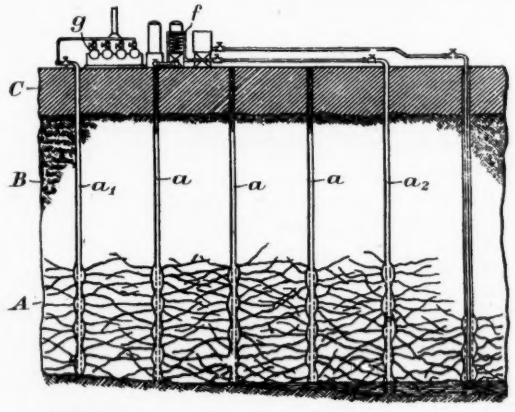
156,447. REFRACTORY MATERIALS FOR FURNACE LININGS, MANUFACTURE OF. A. Rollason, 13, Lime Grove, Long Eaton, Derby. Application date, April 21, 1920.

The object is to produce a basic dead-shrunk non-absorbent material for linings of furnaces and converters from dolomite or magnesite and basic slag. The dolomite or magnesite is granulated to a size between $\frac{1}{8}$ in. and $\frac{3}{4}$ in. diameter, and mixed with about 5 to 10 per cent. of crushed basic slag. The mixture is slowly passed through a basic lined rotary kiln fired internally by gas, oil, or pulverised fuel, so that it is heated to about 1,800°C. The roasted material is then slowly annealed in a closed chamber out of contact with air. The material is then suitable for mixing with a binding material for making into bricks, &c.

156,396. SHALE, METHOD OF TREATING—AND RECOVERING OIL THEREFROM. W. W. Hoover and T. E. Brown, 99, Nassau Street, New York. Application date, December 10, 1919.

Oil shale is distilled *in situ* to obtain petroleum or other products. A number of wells *a* are drilled into a zone of oil shale, *A*, through the surface and overlying formations, *C*, *B*. The wells are drilled with increasing depth in a given direction

to permit of the accumulation of liquid products in the lowest wells. Explosives are then introduced into the wells and fired so that the oil shale zone, *A*, which is normally impermeable is fractured as shown in the illustration. The wells are arranged at such a distance apart that intercommunicating fractures are produced in the zone of treatment. The wells, a_1, are connected by pipes to the boilers, *g*, so that steam may be supplied to them while other wells are sealed at the top, and the wells, a_2, conduct the steam and distillates to the condenser, *f*. The oil shale is raised to the minimum temperature necessary for the conversion of the bituminous material into



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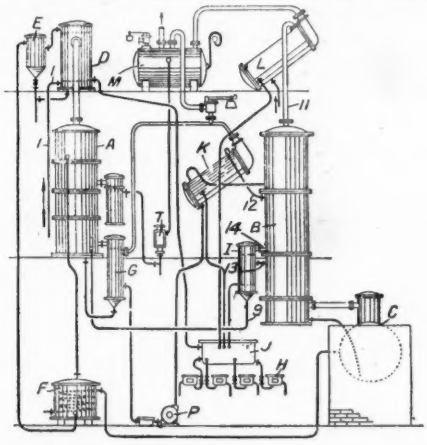
oil, *i.e.*, about 350°C., but the temperature may be varied so as to effect: (*a*) the selective distillation of the more volatile constituents of a bituminous deposit in an oil shale in the order of their volatilisation, and the recovery of the respective products; (*b*) the collective distillation and recovery of one or more groups of such constituents; (*c*) the distillation of the more volatile constituents together with the kerosene content in one group collectively including the conversion of the bituminous content of the oil shale into petroleum or shale oil, and the recovery of the heavier constituents in the liquid state from the deeper wells of the group.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 127,590 (Soc. Franco-Belge de Fours à Coke), relating to horizontal coking ovens, *see* Vol. I., p. 230; 144,710 (Elektro-Osmose Akt.-Ges. Graf Schwerin Ges.), relating to electro-osmotic separations, *see* Vol. III., p. 214; 145,511 (Badische Anilin & Soda Fabrik), relating to solutions of cellulose acetates, *see* Vol. III., p. 292; 147,099 (C. Still), relating to obtaining ammonia from crude gas liquor, *see* Vol. III., p. 404; 152,975 (C. Toniolo and Officine Elettro-chimiche Dr. Rossi), relating to the production of hydrogen and mixtures of hydrogen and nitrogen, *see* Vol. IV., p. 105.

International Specifications not yet Accepted

154,558. DISTILLING HYDROCARBONS, ALCOHOLS, &C. L. Granger and C. Mariller, 38, Rue des Peupliers, Paris, and Soc. Anon d'Exploitation de Procedes Evaporatoires (Systeme Prache et Bouillon), 25, Rue de la Pepiniere, Paris. International Convention date, November 26, 1919.

A distillation plant for crude mineral oils, &c., is combined with a steam generating plant which is heated by the condensed vapour. Oil passes by a pipe, 1, to a dephlegmator, *D*, water separator, *E*, preheater, *F*, and column, *A*, where it is distilled. The vapour driven off is condensed in the dephlegmator, *D*, and the oil passes through a pipe, 9, to a heater, *I*., and thence to another column, *B*. The residue from this column passes to a boiler, *C*, the residue from which passes to the preheater, *F*. Heavy vapour passes from the column, *B*, by a pipe, 13, to the heater *I*, where it is condensed, while lighter vapour passes by the pipe, 12, to a steam generator, *K*, which is maintained at the appropriate pressure. The lightest vapour passes by a pipe, 11, to another steam generator, *L*, the steam from which passes to a vessel, *M*, for use as required. The heater, *G*, is heated by steam from the generator, *K*, and the condensed



154,558

water is returned to the generator by a pump, *P*. The condensed oil vapours pass to a refrigerator, *J*, and test glasses, *H*.

154,562-3. FERTILISERS. Soc. d'Etudes Chimiques pour l'Industrie, 8, Quai du Cheval Blanc, Geneva. International Convention date, November 25, 1919. Additions to 151,597 (*see* THE CHEMICAL AGE, Vol. III, p. 690).

154,562. In the process for converting cyanamide into urea described in 151,597, acid salts are now used, such as sodium or potassium bisulphate. The solution is then concentrated *in vacuo*, and calcium phosphate or other insoluble phosphate is added. The insoluble phosphate may be replaced by other salts having fertilising properties, such as kainite. The calcium cyanamide which has been decomposed in aqueous suspension by carbon dioxide leaves a residue of calcium carbonate and carbon which may be used in the manufacture of Portland cement.

154,563. Calcium cyanamide is decomposed by acid, and the dilute cyanamide solution obtained is used for treating further quantities of calcium cyanamide to obtain a concentrated solution which is allowed to stand, with or without the addition of ammonia. Dicyandiamide separates out and is treated with sulphuric, phosphoric, or nitric acid, with or without the addition of an acid salt, to produce ammonium salts. Superphosphate or other fertilising compound is produced in the mixture by using the excess of acid.

154,579. ALDEHYDE AND ACETIC ACID. A. Wohl, 113, Hauptstrasse, Langfuhr, Dantzig, Germany International Convention date, November 24, 1919.

A mixture of acetylene, air, and steam is passed over a catalyst such as a vanadate, molybdate, or chromate. The catalyst is heated to 300°-400°C. and the resulting mixture of aldehyde and acetic acid is either oxidised completely to acetic acid, or fractionally condensed. In the latter case, the weak aldehyde solution is used for obtaining the necessary steam. To prepare a catalyst, alkaline ammonium vanadate solution is treated with zinc chloride and the precipitate of basic zinc vanadate is deposited on rubbered pumice, the rubber being subsequently burned off.

154,870. CONCENTRATING ORES. Minerals Separation, Ltd., 62, London Wall, London. International Convention date, November 29, 1919.

Oxidised ores of copper, lead, &c., are suspended in water which contains a very small proportion of oleic acid or its near homologues, and sodium silicate, and the mixture is subjected to the froth flotation process by agitation and aeration. Alkalies such as sodium carbonate or caustic soda may also be added. The process may be repeated with the concentrate, a further amount of sodium silicate only being added.

154,895. LUBRICATING OILS. F. C. Thiele, Oklahoma, U.S.A., and C. Cordes, 15, Furstenufer, Magdeburg, Germany. International Convention date, November 24, 1919.

Asphaltiferous crude petroleums or petroleum residues are digested at about 300°C. with a hydrosilicate such as Florida earth or Kambara earth, or with a substance containing hydrosilicic acid, to produce lubricating oils. The oil and other impurities may be removed from the hydrosilicate by washing with solvents such as benzene, carbon tetrachloride and carbon bisulphide.

154,896. CYANIDES AND CYANAMIDES. C. T. Thorssell and H. L. R. Lunden, 20, Kopmansgatan, Gothenburg, Sweden. International Convention date, December 3, 1919.

Mixtures of alkali or alkaline earth metal compounds and carbon are briquetted and then introduced into an electric furnace in such a condition that the moisture content is not above 2·5 per cent. The formation of electric arcs is thereby avoided, and if a shaft furnace is used, agglomeration of the charge and choking of the furnace is avoided. Nitrogen is passed through the mixture to produce cyanide or cyanamide.

154,907. DIOXYDIETHYL SULPHIDE, ESTERS OF. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, January 20, 1919.

Dioxydiethyl sulphide is heated with formic acid and the resulting diformyl ester is isolated by distillation *in vacuo*. If acetic anhydride or dilute or glacial acetic acid is substituted for the formic acid, the diacetyl ester is obtained. Benzoic or phthalic acid anhydrides may be similarly treated to obtain the corresponding esters.

LATEST NOTIFICATIONS

158,202. Mechanism for producing oscillations from rotary motion. Tekniske Forsogakatieselskab. January 29, 1920.
158,227. Process for the melting of basalt and like mineral substances. Soc. Le Basalte. January 23, 1920.
158,228. Mechanism for converting rotary into reciprocatory motion. Tekniske Forsogakatieselskab. January 29, 1920.
157,974. Centrifugal separator for clarifying liquids by continuous process. Rialland, A. J. M. April 30, 1919.
157,975. Products obtained from rubber-containing latex. Hopkinson, E. January 16, 1920.
157,976. Process for the recovery of methane. Jacobs, K. January 12, 1920.
157,978. Process for treating rubber containing latex. Hopkinson, E. January 16, 1920.
157,982. Apparatus for use in reducing alkali cellulose and the like. Kampf, A. January 13, 1920.
157,984. Process of recovering metallic constituents from a mixture thereof. Bishop, H. B. January 14, 1920.
158,248. Apparatus for testing centrifugal pumps, fans or the like. Salmson, Les Fils D'E. January 17, 1920.

Specifications Accepted, with Date of Application

139,776. Soaps and washing-materials, Manufacture of. C. H. Boehringer Sohn (Firm of). November 21, 1918.
144,727. Glycerine or crude glycerine. Process for decolorising liquids containing. Elektro-Osmose Akt.-Ges. (Graf Schwerin Ges.). February 12, 1919.
157,474-5. Tunnel furnaces, kilns, ovens and the like. H. Francart. December 19, 1918.
157,490. Emulsions and the like, Treatment of. W. Broadbridge, E. Edser and Minerals Separation, Ltd. July 8, 1919.
157,514. Heat treatment or evaporation of liquids, Process of and apparatus for. J. R. Ruff. October 6, 1919.
157,554. Lead sulphate direct from lead sulphide ores, Process of making. P. A. Mackay. October 18, 1919.
157,555. Vanadium from its ores, Method of recovering. P. A. Mackay. October 18, 1919.
157,578. Di-ethyl sulphate, Preparation and manufacture of. N. V. Sidgwick, S. G. P. Plant, and A. Boake, Roberts & Co., Ltd. October 30, 1919.
157,688. Centrifugal machine. P. T. Sharples. June 22, 1920.

Applications for Patents

Avesta Jernverks Aktiebolag. Method of producing silicon-manganese-chrome steel. 3672. January 31.
Bailey, A. G. Apparatus for aerating or carbonating liquids. 4294. February 5.
Briscoe, H. V. A. Separating solids by crystallisation from solvents. 3848. February 1.
British Cellulose & Chemical Manufacturing Co., Ltd. Manufacture and treatment of articles made of plastic materials. 3902. February 2.
Cew, J. A. de. Method of preparing dilute solution of resin soap. 3898. February 2.
Fabry, R. Process for purifying coal gas. 4007. February 3.
Fairweather, H. G. C. (Avesta Jernverks Aktiebolag). Method of producing silicon-manganese-chrome steel. 3672. January 31.
Fankhauser, C. A. Squeezing oils and fats from oily and fatty substances. 3922. February 2. (Switzerland, February 3, 1920.)
Green, J. W. Purification and deodorisation of sewage oil or grease. 3741. February 1.
Joliot, P. Manufacture of cellulose threads. 4191. February 4. (France, August 30, 1920.)
Lindsay Light Co. Manufacture of thorium compounds. 4100. February 3.
Mossop, T. Preparation of liquid fuel. 3634. January 31.
Rosthorn, O. von. Manufacture of copper alloys. 4230. February 4. (Germany, February 4, 1920.)
Soc. l'Air Liquide (Soc. Anon pour l'Etude et l'Exploitation des Procédés G Claude). Synthesis of ammonia. 3949. February 2. (France, February 2, 1920.)
Usher, F. L. Extracting essential oils, &c. 3995. February 3.
Zack, M. Obtaining a vacuum by the liquefaction of gases. 4014. February 3.

No Appropriation for Chemical Industries

The Committee on Appropriations of the House of Representatives (*Chemical & Metallurgical Engineering* states) used the knife relentlessly on the requests made by the Bureau of Mines for funds for its work during the next fiscal year. The $125,000 asked for non-metallic and chemical industries research went out altogether, as did the $30,000 for low-temperature research and the $29,920 requested for aluminium research. For the most part, the committee allowed no increases over the appropriations for the current fiscal year. The only new item in the bill, as reported on December 29, was $50,000 for enforcing the oil land-leasing regulations. The bureau had requested $132,390 for that work. The total appropriation carried by the bill for the Bureau of Mines was $1,357,300. In addition to the carefully written justifications prepared in support of these estimates, Dr. F. G. Cottrell, the director of the bureau, argued in person before the Committee on Appropriations. In support of the aluminium research, Dr. Cottrell pointed out to the committee the possibility of obtaining aluminium production from sources and ores not now being utilised. He also emphasised the need for better and cheaper methods of aluminium production. The failure of the committee to allow $30,000 for low-temperature research is regarded as particularly lamentable, since the entire installation for that work has been turned over to the Bureau of Mines, without expense, by the War Department. The War Department purchased complete equipment for the cryogenic laboratory, which was set up by the Bureau of Mines in its own offices. The co-operative agreement provided that the laboratory was to become the property of the Bureau of Mines after the War Department work had been completed. The committee allowed $200,000 for the operation of the mining experimenting stations. This is the amount of the current appropriation. The bureau has requested $270,000 for its work in this direction during the next fiscal year.

Lever Brothers to Absorb U.S. Linseed Co.

Lever Brothers Co., soap manufacturers of Cambridge, Mass., have taken the necessary legal steps under the corporation laws of Maine to increase their authorised capitalisation from $12,000,000 to $150,000,000. The State received a fee of $13,805. The stockholders voted to increase the first preferred stock to 400,000 shares, the "A" preferred stock to 600,000 shares and the common stock to 500,000 shares of a par value of $100. The increase in the capital of Lever Brothers, from $12,000,000 to $150,000,000, was construed in the financial district as a definite step in the plan for a consolidation of American Linseed and Lever Brothers, Ltd., of London, the American company being a subsidiary of the English concern of the same name The plan under which Lever Brothers will take over the company calls for the incorporation of a new company in New Jersey. The preferred stock of the American Linseed Company will be taken in as a first preferred stock in the new company on a share for share basis and the American Linseed common will become a second preferred in the new company on a share for share basis. The stock of the Maine corporation of Lever Brothers would constitute the common stock of the Jersey concern.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

THURSDAY, FEBRUARY 10th.

Purchases are still from hand to mouth and the volume of business passing is only of small proportions. Many of the chemical works, both here and abroad, are more or less closed down and the market is almost entirely secondhand. At the same time there is a more cheerful feeling generally and the hope is expressed that the removal of the Excess Profits Duty will prove a fillip to trade. Unfortunately there is little or no improvement to be detected in the Export Trade.

General Chemicals

ACETONE is in good export demand. Price unchanged.

ACID ACETIC.—The price appears to have touched bottom, but only a small volume of business is reported.

ACID CARBOLIC remains uninteresting and the price is nominal.

ACID CITRIC continues to be offered by secondhands and the price is unchanged.

ACID FORMIC remains in very poor demand and the price is again sagging.

ACID OXALIC continues to decline slowly in price in consequence of Continental offering. There is a steady demand for spot delivery.

ACID TARTARIC remains in little request. Price nominally unchanged.

AMMONIA CARBONATE.—The drastic reduction in prices which was notified last week does not seem to have stimulated business to any appreciable extent.

BLEACHING POWDER remains slow of sale and some of the makers are reported to have closed down.

COPPER SULPHATE is featureless and a lower level of prices is not improbable.

FORMALDEHYDE.—The price is firmly maintained, but the article remains slow of sale.

LEAD ACETATE is easy with little business moving.

LITHOPONE.—The demand has become more stagnant, although no change in price is indicated.

MAGNESIUM SALTS remain uninteresting.

POTASSIUM BICHROMATE is in slow demand, although a few export inquiries are reported.

POTASSIUM CARBONATE.—The market is dead and no early improvement seems likely.

POTASSIUM CAUSTIC.—The market is overstocked and the demand is purely nominal.

POTASSIUM PRUSSIATE remains slow of sale. The supplies appear to be in few hands and are firmly held.

SALAMMONIAC is freely offered from the Continent at low prices, but no important business can be detected.

SODIUM ACETATE remains in fair demand. Price is slightly easier.

SODIUM BICHROMATE remains a secondhand market and the turnover is quite small.

SODIUM CAUSTIC is an easy market and favours buyers.

SODIUM HYPOSULPHITE is only in limited demand. Price unchanged.

SODIUM NITRATE is inclined to show a slightly better tone as some of the weak holders have been eliminated.

SODIUM PRUSSIATE is none too firm and the absence of demand may bring about a still lower standard of value.

Coal Tar Intermediates

There has been a slight improvement in this section and buyers are beginning to place orders for materials they require for near delivery.

ALPHA NAPHTHOL is steady, but only a small business is passing.

ANILINE OIL AND SALT are only in very quiet demand at last quoted figures.

BETA NAPHTHOL is in slightly better request and the price shows a much more steady tendency, doubtless owing to the fact that foreign supplies now require an import licence.

DIMETHYLANILINE is in slightly better request, but the price remains without change.

DIPHENYLAMINE.—This product is in steady demand at recent figures.

NITRO BENZOL is in slow request and the value is quite steady.

NAPHTHIONATE OF SODA is in fair request.

PARANITRANILINE is slow of sale and price is a shade easier.

RESORCIN is again lower with practically no business to report.

SALICYLIC ACID remains featureless in buyers' favour.

SULPHANILIC ACID is in small demand at recent figures.

Coal Tar Products

There seems to be a more cheerful tone in the market this week, and a slightly increased amount of business has been passing, although not sufficient to stiffen prices.

90's BENZOL remains fairly steady at 2s. 9d. to 2s. 10d. on rails in the North, and 2s. 11d. to 3s. on rails in the South.

PURE BENZOL is worth 2s. 10d. to 3s.

CREOSOTE OIL is now worth 11½d. to 1s. in the North, and 1s. 1d. to 1s. 2d. in the South.

CRESYLIC ACID is weak at 2s. 9d. to 3s. on rails for Dark 95/97 per cent., with 3s. 6d. to 3s. 9d. for Pale 97/99 per cent.

SOLVENT NAPHTHA is quoted at 2s. 5d. on rails.

HEAVY NAPHTHA is worth from 2s. 9d. to 3s.

NAPHTHALINE continues weak, crude qualities being worth from £9 to £15 per ton, and Refined £24 to £26 per ton.

PITCH.—The market is still very dull, and very little business has been passing. Some small transactions have been done at 160s. f.o.b., but second-hand sellers may accept lower prices.

Sulphate of Ammonia

There is no change in the prices for Home Trade, but Export prices are lower.

French Market Report

The market continues absolutely stagnant and conditions are, if anything, still worse.

Business continues on a hand-to-mouth basis. The following is a list of prices at present ruling :—

ACETONE, 500 francs.
ACID ACETIC 80 per cent., 390 francs.
ACID CITRIC, 16·5 francs per kilo.
ACID LACTIC, 250 francs.
ACID OXALIC, 820 francs.
ACID TARTARIC, 12 francs per kilo.
ALUM, 125 francs.
BARIUM CHLORIDE, 125 francs.
CALCIUM CHLORIDE, 45 francs.
BLEACHING POWDER, 100 francs.
HYDROGEN PEROXIDE, 130 francs.
LEAD ACETATE, 240 francs.
LITHOPONE, 200 francs.
POTASSIUM PERMANGANATE, 18 francs.
POTASSIUM PRUSSIATE, 8 francs.
SODIUM CAUSTIC, 115 francs.
SODIUM HYPOSULPHITE, 125 francs.
SODIUM SULPHIDE, 150 francs.

All the above prices are per 100 kilos, unless otherwise stated.

German Market Report

Business continues quiet, and most prices are again lower, both for home and export accounts.

OXALIC ACID is quiet at about 10 marks per kilo.

ARSENIC is in fair demand at 15 marks.

ALUMINA SULPHATE is in fair request at 250 marks per 100 kilos for the better quality.

AMMONIA CARBONATE POWDER is idle at 6 marks.

COPPER SULPHATE is easy at 8 marks.

POTASSIUM PERMANGANATE is slow of sale at 45 marks.

POTASSIUM BROMIDE is about 16 marks.

SODIUM HYPOSULPHITE is standing at 3·50 marks.

SODIUM SULPHIDE has again declined and is now 7 marks per kilo.

Current Prices

Chemicals

	per	£	s	d.		£	s	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	100	0	0	to	105	0	0
Acid, Acetic, glacial, 99 100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	72	10	0	to	74	0	0
Carbolic, cryst. 39 40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	4	to	0	2	6
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	9	to	0	5	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	42	10	0	to	43	10	0
Lactic, 60 vol.	ton	47	10	0	to	50	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	0	to	0	1	1
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	10	6	to	0	10	9
Salicylic, Technical	lb.	0	1	6	to	0	1	8
Salicylic, B.P.	lb.	0	1	4	to	0	1	6
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	11	to	0	2	0
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to	—		
Ammonia, chloride	ton	85	0	0	to	90	0	0
Ammonia, muriate (galvanisers)	ton	57	10	0	to	60	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	77	10	0	to	80	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	21	0	0	to	23	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	8
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	22	0	0	to	23	0	0
Borax crystals	ton	39	0	0	to	41	0	0
Calcium acetate, Brown	ton	15	0	0	to	17	0	0
,, Grey	ton	23	0	0	to	25	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to	0	16	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	39	0	0	to	40	0	0
Cream Tartar, 98-100%	ton	200	0	0	to	210	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	130	0	0	to	135	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0

	per	£	s.	d.		£	s.	d.
Lead acetate, white	ton	58	0	0	to	60	0	0
Carbonate (White Lead)	ton	47	0	0	to	50	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	53	0	0	to	55	0	0
Lithopone, 30%	ton	37	10	0	to	40	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to	—		
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	1	to	—		
Carbonate, 90%	ton	85	0	0	to	90	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	290	0	0	to	205	0	0
Nitrate, refined	ton	63	0	0	to	65	0	0
Permanganate	lb.	0	2	6	to	0	2	9
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	0	0	to	—		
Seconds	cwt.	4	15	0	to	—		
Sodium acetate	ton	45	0	0	to	47	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	9½	to	0	0	10
Bisulphite, 60-62%	ton	37	10	0	to	49	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	27	0	0	to	28	0	0
Caustic, 76%	ton	28	0	0	to	29	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	26	0	0	to	27	0	0
Nitrite, 96-98%	ton	60	0	0	to	62	0	0
Phosphate, crystal	ton	32	0	0	to	35	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	22	0	0	to	25	0	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst.	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	6	to	0	2	9
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	—			to	—		
Benzaldehyde (free of chlorine)	lb.	0	5	3	to	0	5	6
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	6	to	0	2	9
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	9	6	to	0	10	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3

	per	£ s. d.		£ s. d.
H-Acid	lb.	0 10 0	to	0 10 6
Metaphenylenediamine	lb.	0 5 9	to	0 6 0
Monochlorbenzol	lb.	0 0 10	to	0 1 0
Metanilic Acid	lb.	0 7 6	to	0 8 6
Monosulphonic Acid (2:7)	lb.	0 7 6	to	0 8 0
Naphthionic acid, crude	lb.	0 4 0	to	0 4 3
Naphthionate of Soda	lb.	0 4 3	to	0 4 6
Naphthylamin-di-sulphonic-acid	lb.	0 5 0	to	0 5 6
Nitronaphthalene	lb.	0 1 6	to	0 1 8
Nitrotoluol	lb.	0 1 4	to	0 1 5
Orthoamidophenol, base	lb.	0 18 0	to	1 0 0
Orthodichlorbenzol	lb.	0 1 1	to	0 1 2
Orthotoluidine	lb.	0 2 3	to	0 2 6
Orthonitrotoluol	lb.	0 1 3	to	0 1 4
Para-amidophenol, base	lb.	0 12 6	to	0 13 0
Para-amidophenol, hydrochlor	lb	0 13 0	to	0 13 8
Paradichlorbenzol	lb.	0 0 7	to	0 0 8
Paranitraniline	lb.	0 6 6	to	0 7 0
Paranitrophenol	lb.	0 2 9	to	0 3 0
Paranitrotoluol	lb.	0 5 9	to	0 6 0
Paraphenylenediamine, distilled	lb.	0 13 6	to	0 14 6
Paratoluidine	lb.	0 8 3	to	0 8 6
Phthalic anhydride	lb.	0 4 9	to	0 5 0
Resorcin, technical	lb.	0 7 6	to	0 8 6
Resorcin, pure	lb.	0 9 6	to	0 10 0
Salol	lb.	0 4 0	to	0 4 3
Sulphanilic acid, crude	lb.	0 1 8	to	0 1 .
Tolidine, base	lb.	0 8 6	to	0 10 0
Tolidine, mixture	lb.	0 2 9	to	0 3 0

Cardiff By-Products

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£24 3s. 6d.
For export (per ton f.o.b.)	£20 to £30
National Benzole (per gallon)	3s. 2d. to 3s. 7d.
Solvent Naphtha (per gallon)	2s. 9d. to 3s.
Heavy Naphtha (per gallon)	3s. 2d. to 3s. 3d.
Crude Naphthalene Salts (per ton)	£9 to £15
Pitch (per ton)	130s. to 160s.
Creosote (per gallon)	1s. to 1s. 2d.
Motor Benzol (per gallon)	3s. 2d. to 3s. 7d.
Crude Benzol (per gallon)	1s. 9d. to 2s.
Toluol (per gallon)	4s.

French Potash

Reports from the fertiliser trade indicate that buyers are now more interested in obtaining supplies of Alsatian potash. During the past week quotations have been approximately £6 for French kainit, 14 per cent., and £8 2s. 6d. for French potash salts, 20 per cent.

The exploitation of the extensive potash deposits in Alsace during the past year has exceeded most expectations. The total sales for 1920 amounted to approximately 200,000 tons of pure potash. At the present time the output of muriate of potash from the Alsatian mines is being increased in accordance with the demand, and installations for the manufacture of sulphate of potash are also being extended. It seems probable, however, that muriate of potash and the French potash salts will be much more in demand during the next few years than sulphate of potash. The results of extensive trials seem to indicate that no real advantages can be gained by the use of potash in the form of sulphate. In fact, for grass land and for most field crops the evidence is almost entirely against it, where comparisons have been made with less expensive forms of potash. The fact is now admitted that most soils are deficient in potash, and farmers ought to inquire for the grades which will give the best returns at the lowest price.

Anglo-French Glass Alliance

It is announced that an arrangement has been entered into between the Colonial & Foreign Glass Industries, Ltd., and the Société Industrielle de Paris, which owns ten large works manufacturing glass of various kinds. These two companies have taken an important participation giving them the control of the Compagnie Industrielle de Verre à Vitres, manufacturing window glass and rolled glass at three existing works in France. This company is engaged at present in equipping a fourth works with machinery for the manufacture by mechanical means of window glass under the Fourcault patents, having acquired the licence for the manufacture of window glass under this process from the Colonial & Foreign Glass Industries, Ltd. Negotiations are proceeding between the companies for the interchange of agreements affecting other patent and commercial rights.

Inflammable Varnish

Need for Labelling Drums

At an inquiry on Monday into the death of Henry Esilman, a foreman in the employ of the Manchester Chemical Co., Gibbon Street, Manchester, the Manchester City Coroner explained the need for labelling inflammable varnishes as such.

Giving evidence, Mr. Alfred Haslam said he had been pouring out a drum of varnish when Esilman came into the room and suggested bringing a light. He did so and the drum burst into flames, both being badly burned. Esilman died in hospital on February 5.

Mr. A. S. Walsh, of Messrs. Smith & Forest, tar and resin distillers, said his firm had supplied the varnish; they gave no certificate of inflammability, nor was there any label on the drums.

The Coroner said it was most important that the varnish should be labelled inflammable. He advised the witness to see that this was done in future, and suggested that specific directions should be sent out with each tin. Replying to a question, the Coroner said he had no power to enforce his advice, but if such an accident occurred again he would summon a jury and explain to them the facts of the case, and a charge of manslaughter would probably be brought in.

A verdict of accidental death was given.

A Disputed Contract

In the King's Bench Division on January 3 Mr. Justice Sankey had before him an arbitrator's award on a dispute arising out of a contract dated February, 1920, under which Peters, Rushton & Co., of Mincing Lane, E.C., sold 80 tons of linseed oil to Charles Weiss & Co., of St. Mary Axe, E.C.

For the sellers, Mr. Buchanan said Peters, Rushton & Co. were to deliver within 14 days of the receipt of instructions by the buyers as to destination. Instructions were given on April 21 to deliver at a wharf at Rotherhithe. Delivery should, therefore, have been made by May 7.

On May 5, however, the buyers closed the contract, having made a miscalculation as to the time that the sellers had for delivery. They repudiated the contract and bought against the sellers. The arbitrator found that the buyers closed on May 5, while the sellers had until May 7, but he nevertheless awarded £1,600 dmaages against the sellers. His finding, counsel submitted, was wrong.

For the buyers, Mr. Van den Berg, stated that no delivery was made. He contended that the sellers must show that they accepted the buyers' suggested repudiation.

Following some argument, Mr. Justice Sankey said that upon the information he could not decide the case. It must go back to the arbitrator to say whether there was a repudiation and whether it was accepted. The parties would have liberty to call evidence before the arbitrator. Costs of the hearing would abide the event.

German Reparations

The Reparations Commission has issued a Note, together with a list of goods handed over to the Allies up to December 3, 1920. The total deliveries of dyes and dyestuffs amount to 10,787,827 kilos, of which Great Britain is awarded 3,113,809 kilos., France having 3,172,639 kilos., and the United States 1,300,143 kilos. The bulk of sulphate of ammonia delivered amounted to 19,000 tons, and pharmaceutical products were delivered to the extent of 57,823 kilos.

Recent Wills

Mr. J. B. Wilkinson, of 140, Holme Lane, Dudley Hill, Bradford, manufacturing chemist	£28,690
Mr. E. Daniel, of 91, Upper Talbot Street, Nottingham, chemist and druggist	£4,481
Mr. F. Burrows, of The Square, Beeston, Notts., chemist, druggist	£234
Mr. T. L. Anderson, of Damside, Auchterarder, Perthshire, a director of the Emerald Rubber Cocoanut Co., Ltd., and other rubber companies, largely interested in the Explosives Trades Co., Ltd.	£108,367

Company News

GAS LIGHT & COKE.—Presiding at the annual meeting of the Gas Light & Coke Company, Mr. D. Milne Watson, said £369,000 had been spent on capital account mainly for new ships, and there was a credit of £323,000 due to sales of stoves on hire and to depreciation of meters and stoves, leaving an unexpended balance of £609,000 on capital account. The total expenditure in the revenue account had increased by £2,750,000 from £9,000,000 to £11,750,000, but this was largely met by increased revenue from residuals, which showed an increase of £2,000,000. The dividend of 3 per cent., compared with £4 17s. 4d. per cent. paid in 1913. The result of the company's working for 1920 was that, after distributing a dividend of 3 per cent., the maximum allowed under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, there was a carry forward of £326,597, as against £323,971 last year. The new standard price of gas of 1s. 3·2d. per therm should, in future, allow of a distribution, if profits permit, of a dividend of £4 13s. 4d. per cent., per annum, after allowing for the statutory contribution to the redemption fund.

MOND NICKEL.—Interim dividend of 3½ per cent. on the cumulative and non-cumulative preference shares, less tax, payable March 3.

PAN DE AZUCAR NITRATE.—For the year to June 30 last the gross profit is £23,129, which, with interest and discount and transfer fees makes £23,440. Deducting London expenses, £2,432; reserve for income-tax and corporation profits tax, £7,310; exhaustion of raw material and depreciation of plant, £6,852; insurance reserve, £300, the net profit is £6,545; and £25,591 was brought in, making £32,136. The directors recommend the dividend of 10 per cent., free of tax, carrying forward £21,136. The prices obtained for nitrate averaged 10s. 4d. per quintal for the twelve months to June 30 last, and on that date there was a stock of 174,714.80 quintals of manufactured nitrate at the oficina, which was valued at cost (£43,742). This stock has since been sold at an average price of about 16s. per quintal, and the profit thereon will be credited in the next accounts. Profit has been taken in the accounts on qtls. 374,000 of nitrate, as against qtls. 192,082 in the previous year. In response to the wish of a large number of shareholders the directors have decided, subject to the approval of proprietors, to split the £5 shares of the company into shares of £1 each, and a resolution to give effect to this is to be submitted. Meeting, Winchester House, February 15, noon.

READING GAS CO.—A profit is shown for the year 1920 of £17,219. Including interest receipts and £22,420 brought in, and after paying debenture interest and interim dividends, the available balance is £31,787. Balance dividends are now recommended at the statutory rates of 5 per cent. per annum making 5 per cent. for the year, less tax.

SOUTH METROPOLITAN GAS.—For the year 1920 the directors report the passing of the company's Act of Parliament, by which the unfair sliding scale has been abolished and a more stable and equitable apportionment of profits established between consumers, shareholders and employees. The new Act authorises a dividend of 5 per cent. per annum on the issued ordinary stock, and the directors propose a dividend at that rate in respect of the period under review, payable March 3. The accounts for the year show that the increased expenditure on coal, labour and materials has been practically counterbalanced by additional revenue from the sale of gas and residuals. The markets for by-products were very favourable until the latter months of the year.

SOUTH STAFFORDSHIRE MOND GAS.—The report for the year ended December 31 states that the gross profit for the year was £36,407, compared with £15,875 in 1919, and the net profit £27,016. It was proposed to pay the preference dividend for 1919 on February 28, leaving £35,470 to be dealt with as the shareholders may determine at the annual meeting on the 22nd. As the bank overdraft in December was £38,320 the board do not recommend the payment of the preference dividend for 1920 at present, but that it be paid on July 1 next. They also recommend that a distribution at the rate of 10s. per share be made to the ordinary shareholders in 5 per cent. debenture stock on July 1 next. This will increase the capital account, and reduce the balance of the profit and loss account by £16,858, will wipe out £2,015 now overspent, and give a margin on capital account of £14,842. It is also recommended that £10,000 be written off the suspense account.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Canada ...	Cyanide. Replies to the Canadian Government Trade Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C. 2	—
Egypt ...	Soap...	163
Brussels ...	Hemp and jute raw	168
New York ...	Glassware	181
New York ...	Scientific apparatus	182
Madrid ...	Heavy chemicals	—
Rome ...	Oils; paints; varnishes	—

Tariff Changes

AUSTRALIA.—The operation of Customs duties on carbonates and bicarbonate of soda and soda silicate has been postponed until January 1, 1922.

EGYPT.—Exports of the following are prohibited except under licence: Coal tar products and derivatives suitable for use in the manufacture of explosives; explosives of all kinds; cocaine, its salts and derivatives and chemical fats.

BELGIUM.—Salt may now be exported without the necessity of obtaining a licence.

ITALY.—The list of goods prohibited from export (except under licence) include chemical fertilisers, glucose, mineral, resin and tar oils, crude, heavy or light, and residues from the distillation of mineral oils; permanganate of potash; potassium salts, including salts derived from the drying of sugar beet; pyrites, sulphate of copper; and toluol and mixtures thereof. The following may be exported without licences: "Oildag," betanaphthol, benzol, chloride of potash, bichromate of potash, and dinitraluse.

Chemical Works Explosion

Works Manager Fatally Injured.

FIVE men were injured, two seriously, in an explosion which occurred on February 4 at the Eagle Chemical Works, Oswaldtwistle, the proprietors of which are Messrs. Bowdler & Bickerdike. The explosion took place in the filling department, where several workmen were attending to a cask which contained a compound of which one of the ingredients was phenol. The substance was ignited by some means at present unknown, and the men in the vicinity of the cask were burned in the resulting explosion. Among the injured was Mr. A Sandiford, the general manager, who succumbed to his injuries on Wednesday. All were found to be suffering from burns, and their faces appeared to have been dyed black. The fire which followed the explosion was soon extinguished, and the building was very little damaged.

Institute of Metals

THE Institute of Metals announces that the annual general meeting of the Institute will be held at the House of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1, on March 9 and 10. The dinner will be held at the Trocadero Restaurant on March 9, and on March 10 there will be a visit to the National Physical Laboratory. Papers will be submitted on "Stages in the Re-crystallisation of Aluminium Sheeting on Heating, with a Note on the Birth of Crystals in Strained Metals and Alloys," "Some Notes on Calcium," "Plastic Deformation of Some Copper Alloys at Elevated Temperatures," "The Action of Reducing Gases on Heated Copper," "The Season Cracking of Brass and other Copper Alloys," and "The Constitution of the Alloys of Copper with Tin, Parts III. and IV."

Future of Dye and Glass Industries

The Duty of Parliament

SPEAKING on Wednesday at the ordinary general meeting of the South Metropolitan Gas Company, Dr. Carpenter (the chairman) said that the story of the manufacture of dye products was a very chequered one, and manufacturers had often been chided upon their apathy in this respect. That charge was an unfounded one. If we had not been a nation of shipbuilders, it would have taken us years of training before we could have turned out Queen Elizabeths or Aquitanias.

The Germans learned their shipbuilding largely from us, and we can learn dye-making from them, given time and encouragement such as they had. It must be a blow to the public, who experienced the powers of "Dora" in many trivial affairs of the nation, to think that she was powerless to exclude the admission during November last of £1,881,275 worth of German dyes, an increase of £1,528,532 over the previous month. It is true, said Dr. Carpenter, that the Act passed in the closing hours of last session will do something to obviate this in future, but it is unfortunate that the country was allowed to be flooded throughout its length and breadth with these chemicals before the mischief was stopped. Is the same thing going to happen with heat-resisting glass? One of the most important firms of glass manufacturers in England had been for the past two or three years engaged in building up an industry of this character. The quality of its product is equal to the German article, and the finish is fast approaching the same high level. Naturally, the firm needs sympathetic help in its endeavours during the period necessary to establish its manufactures on a basis which will enable it to meet foreign competition on equal terms. Surely it is an obvious duty of Parliament to encourage production in home industries, and not to stand by passively watching their destruction. It seems not a little difficult to understand the reasons determining this attitude of the Government to a manufacturer seeking to build up a new industry, while at the same time giving support to a trust formed mainly to control prices. This is, however, what has happened in the case of sulphate of ammonia.

We have been bound hand and foot to the Sulphate of Ammonia Federation, and except through that organisation we are unable to export a single ton of our make of a product, over 90 per cent. of which was exported prior to the war. In the manufacture of this article we have proved that our chemists can produce on a working scale a material of the very highest quality. And it is monstrously unfair that we should have been inhibited from selling direct to our customers without the enforced intervention of a trust, whatever proportion of our make could, in common with that of other makers, be spared for export.

Chemical Plants in Germany

SOME interesting information is contained in a recently published report on the German chemical industry during 1919. According to the report there were no less than 15,060 chemical plants in operation in Germany. Leipzig heads the list with 2,648 and Cologne had 2,562. Berlin followed closely with 2,518, and Hamburg had 2,043. The remaining plants were distributed between Nüremburg (1,648), Mannheim (1,325), Breslau (1,235), and Frankfort (1,081).

The total number of workmen, full and part time, employed in these plants amounted to 544,161, a decrease of 18·18 per cent. on the previous year. The number of working days for full-time workmen totalled 88,231,447, as compared with 107,835,679 for the previous year. This is partly accounted for by the decrease in the number of plants, the total plants in operation in 1918 being given as 15,204; this in turn may be attributed to the elimination, for German purposes, of the plants operating in Alsace-Lorraine.

It is of interest to note that compared with 1913 the total amount of wages distributed was tripled in 1919, while during the same period the average yearly remuneration of the full time workman increased from 1,266 marks to 3,612 marks. Although no statistics are available for 1920, it is probable that the annual earnings will be increased to something like 18,000 marks. Calculated according to the present state of the German exchange, however, this sum would only amount to about £75 in English money.

"Two Centuries of Cooksons"

MESSRS. COOKSON & CO., LTD., Newcastle-on-Tyne, have forwarded us a copy of their trade publication "Two Centuries of Cooksons." It is designed and printed in a style which only a firm with a high respect for its reputation and with a long and successful history would be likely to attempt. The embossed dates on the title page "1704–1917" are sufficient evidence of the standing and repute of the firm.

Of particular interest are the results of the experiments made in connection with Cookson & Co.'s sheet lead and lead pipe for chemical works. By a new process of super-refinement a lead is obtained of quite exceptional purity, showing highly resistant properties in heating tests with the various common acids and mixtures. So well satisfied indeed are the makers with their tests that they are able to give a guarantee of 99.99 per cent. purity. The flash point with H_2SO_4 conc. is 300 to 315°C. These, it may be said confidently, are no mere paper results. They are borne out by experience in numbers of important chemical works, and many testimonies are quoted as to the satisfaction of the users. A business house with a reputation of over 200 years could not well afford to run the risk of placing on the market materials unequal to the claims made respecting them. Apart from Cookson's guarantee, in itself good evidence of the firm's belief in their own productions, their chemical sheet lead has now been used in large works for a sufficient length of time to make the testimony to its purity, its resistant power, and, consequently, the life of the plant, conclusive. Apart from quality, special attention, we understand, is given to the rolling and cutting of sheet lead to exceptional sizes and shapes, and to the meeting of any special needs or specifications for chemical works.

Chemical Exporters' Affairs

STATUTORY meetings of creditors and shareholders in the compulsory liquidation of Hill Brothers (London), Ltd., chemical merchants and exporters, 5, Fenchurch Street, E.C., were held last week at the Board of Trade offices, 33, Carey Street, W.C.

Mr. H. E. Burgess, Official Receiver, reported that the company was registered in August, 1919, with a nominal capital of £30,000. The business had been started about a year previously by Mr. Ernest George Hill and his brother, Arthur John Hill. The company had a small connection with Italy, to which country they had exported chemicals. The business had previously been financed by Mr. James Crichton to the amount of £1,000. The business carried on by the company was that of chemical merchants, exporting chemicals to Italy. Accounts prepared covering the first 10 months' trading showed sales of £37,700, and a gross profit of £200, or less than ½ per cent. on the turnover. The net loss was shown at £5,427. Very little trading was done after the first 10 months. The assets were then valued at £7,841, and there was an excess of liabilities of £1,803, so the company was undoubtedly insolvent at that time.

No statement of the company's affairs had yet been lodged, but the unsecured liabilities were roughly estimated at £1,844; partly secured £7,421; the security being valued at £2,010, making total liabilities expected to rank for dividend £7,254. The only assets were valued at £92 and were covered by a debenture for £300. Taking the shareholders into account there was a total deficiency in assets of £24,933.

The liquidation was left in the hands of the Official Receiver.

Fire at a Chemical Works

EARLY last Sunday a fire was discovered by a watchman at the chemical works of Messrs. Morris & Griffin, Corporation Road, Newport. The outbreak was located in a building containing a large quantity of grease and fat and had secured a good hold before the arrival of the fire brigade. The fire burned for about two hours, but the brigade prevented the spread of the flames to the acid and fertiliser departments, which are carrying on as usual. The damage has been roughly computed at nearly £10,000. The cause of the fire is at present unknown.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

First Meeting and Public Examination

HOOKE, D. B. (a firm), 83, Upper Thames Street, London, india rubber merchants, February 2. First meeting, February 15, 11 a.m.; public examination, April 8, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C. 2.

Application for Discharge

DAVIS, H. J., 58, White Hart Lane, Barnes, Surrey, oil and colourman. March 7, 1921, 10.30 a.m. Court House, Garratt Lane, Wandsworth.

Company Winding Up

BLACKMOOR CHEMICALS & COLOURS, LTD., 40-44, Holborn Viaduct, London.—High Court of Justice. Date of Order, January 25, 1921.

Companies Winding Up Voluntarily

ATLANTIC PATENT FUEL CO., LTD., A. C. R. Hare, 31-34, Basinghall Street, London, E.C.2, Liquidator.

CAPSOL DYE COMPANY, LTD. (in voluntary liquidation).—A meeting of creditors will be held at the office of the Liquidator, 47, Talbot Road, Blackpool, February 23, at 3 p.m. Creditors' claims on or before March 1, to the Liquidator, Lewis Aspinall, at the above address.

COAL BY-PRODUCTS (PARENT) SYNDICATE LTD. (in voluntary liquidation).—A meeting of creditors will be held at Third Floor, Donington House, Norfolk Street, Strand, London, W.C. 2, on Friday, February 18, at 4 p.m. Liquidator, A. W. Bellman, 6, Martineau Road, Highbury Hill, London, N. 5.

THE MANX SILICA CO., LTD. (in voluntary liquidation).—A meeting of creditors will be held at the offices of Thomas Fuller Carter, Son & White, 79, Wool Exchange, Coleman Street, London, E.C. 2, on Monday, February 21, at 3 p.m. Creditors' claims on or before March 31, to the Liquidator, H. M. Carter, at the above address.

Liquidators' Notice

HIGH TEMPERATURE GENERATORS, LTD.—A general meeting of members will be held at the offices of F. Morse & Co., 1 and 2, Great Winchester Street, London, E.C. 2, on Monday, March 14, at 11 a.m. F. Morse, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

NATIONAL PAPER & PULP CO. (1920), LTD., London, E.C.—Registered January 26, £200,000 debentures secured by Trust Deed dated January 10, 1921; charged on mills, cots, &c., at Chipping Wycombe and warehouse, 66, Upper Thames Street, E.C., also general charge.

WEST RIDING CHEMICAL CO., LTD., Mirfield.—Registered January 26, mortgage securing all moneys due or to become due to National Provincial & Union Bank of England, Ltd.; charged on lands and hereditaments at Mirfield. *Nil. February 17, 1919.

Satisfaction

BRITISH METALS EXTRACTION CO., LTD., London, E.C.—Satisfaction registered January 31, £19,597 8s. 1d., part of amount registered May 13, 1918.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

JENKINS, T. C., 3, Gore Street, Piccadilly, Manchester, chemical merchant. £12 4s. 8d. December 21.

STANSFIELD, J. L., Boothfold, Waterfoot, chemical manufacturer. £43 13s. 8d. December 14.

ROBIE, A. V., 3, St. John Street, Huddersfield, chemical merchant. £28 16s. 10d. December 22.

WRIGGLESWORTH (E. H.), LTD., St. Andrew's Works, Mason Street, Hull, manufacturing chemists. £31 6s. 6d. October 7.

A. PAYNE & CO., 1, Harrowby Street, Cardiff, oil manufacturers. £30 1s. 4d. November 17.

BALL, F., 4, Crichton Place, Cardiff, chemist. £11 18s. December 22.

HUDSON, S., 14, Doge Street, Cardiff, chemist. £28 8s. 4d. December 22.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

ALGAMATED PHOTOGRAPHIC MANUFACTURERS, LTD. Manufacturers of photographic cameras, plates, films, papers, &c. Nominal capital £1,100,000 in 1,100,000 shares of £1 each. Minimum subscription 7 shares. Directors: A. E. Parke, G. S. Whitfield, L. D. Whitfield, A. Kershaw, C. Kershaw, T. L. Parke, F. G. Thomas, H. C. Rich, G. M. Bishop, C. F. S. Rothwell. Qualification of directors, £100. Remuneration of directors, £250 each; chairman, £500.

BLUNT, SIDNEY H., LTD., 1 Finnemore Road, Little Bromwich, Birmingham. Manufacturing wholesale and retail pharmaceutical and analytical chemists and druggists. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: S. H. Blunt, Hannah Blunt. Qualification of directors, 1 share.

COLOIL SYNDICATE, LTD., 10, Throgmorton Avenue, E.C.2. Petroleum, asphalte, naphthaline or oil-bearing lands in the republic of Colombia, and turn same to account. Nominal capital, £15,000 in 300,000 shares of 1s. each. Minimum subscription, 7 shares. Directors: H. Krall, P. E. Butler. Qualification of directors, 100 shares. Remuneration of directors, £100 each.

LAMBERT, CHARLES, & CO., LTD., North Dean Dye Works, North Dean, West Vale, near Halifax. Oil merchants and grease extractors. Nominal capital £5,000 in 2,500 ordinary shares and 2,500 ordinary shares of £1. Directors: G. H. Lambert, E. J. Latham. Qualification of directors, £1,000.

TAR DISTILLERS, LTD., 44, Grosvenor Place, S.W. Tar distillers and chemical manufacturers, &c. Nominal capital, £100,000 in 100,000 shares of £1 each. Directors: to be appointed by subscribers. Qualification of directors, £1,000.

TAYLOR, JOSEPH (SATURATORS), LTD., Blackhouse Street, Bolton. Regd. February 3rd, 1921. Heavy lead working and the manufacture and working of solid lead saturators. Nominal capital, £20,000 in 20,000 shares of £1 each. Directors: J. Taylor, Selina A. Taylor. Qualification of directors, one share.